Editor's Page

Drilling Contractor Troubles

THE rotary drilling contracting business continues to be plagued by the failure of prices to keep pace with increased costs. This unhealthy economic condition is the result of drilling operations being far more costly today than prewar levels, while contractors receive only slightly more for their work than they did in 1941. The situation has existed for some years and shows no signs of immediate improvement.

Total rotary drilling costs rose 6 percent last year, boosting them to 26 percent larger than in 1948, to 64 percent above 1945 and 86 percent more than in 1941. On the other hand, drilling revenue or prices are only 3 percent above 1950, 2 percent less than in 1948, 12 percent under 1945 and 3 percent above 1941 levels.

These figures mean that whereas a medium rotary rig in 1941 may have cost $500 a day to operate it now costs $930 per day. A heavy duty rig which could be operated for $700 per day in 1941 now costs $1300 a day.

To a limited extent contractors have been able to partially offset the growing margin between cost and income by increased efficiency. The average rate of penetration (speed of making hole) in the U. S. today is 40 percent greater than in 1941, 35 percent above 1945, 20 percent better than in 1948, and 5 percent above 1950.

Major factors in increased rotary drilling costs are (1) higher wages, greater equipment costs and operating expenses; (2) greater depth of wells; and (3) the larger proportion of exploratory or wildcat wells being drilled.

Labor costs on rotary rigs are 96 percent above 1941; 56 percent over 1945; 26 percent greater than in 1948; and 6 percent over 1950. Equipment costs are 6 percent above 1950; 36 percent over 1948; 71 percent above 1945; and 81 percent greater than in 1941. Miscellaneous costs are 82 percent above 1941; 62 percent over 1945; 17 percent more than in 1948; and 7 percent above 1950.

Higher costs with little increase in revenue create a serious situation.

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THE INEVITABLE RESULTS from a continuation of these conditions will be a deterioration in drilling efficiency. Unless satisfactory profit incentives exist it will not be worthwhile for contractors to invest large sums in keeping their equipment in uptodate condition. This will lead to the liquidation of physical assets into cash, and drilling equipment will become obsolete and worn out.

The manpower situation also is critical. Low prevailing wages do not attract good men. Higher wages are a necessity. Crewmen now receive only $1.66 per hour, despite the skilled nature of their work and the necessity of constantly moving with the rigs. The Wage Stabilization Board has not looked with favor on any large increases, and the lack of profits does not encourage contractors to want to boost wages too much. This condition will lead to a deterioration in drilling efficiency as quickly as will poor equipment.

Deterioration of the drilling branch of the industry would be harmful to oil producers as well as drilling contractors. A healthy drilling contractor situation is particularly important at this time when the industry finds it necessary to increase the number of wells drilled yearly.

Warren L. Baker

A Guest Editorial

Security, the Pursuit of Opportunity

By R. L. TOWNSEND

Tweco Products Company
Wichita, Kansas

THE OTHER DAY my boy turned 18. Within the week he received an official looking letter from the U. S. Air Force recruiting office. It was a form letter, the only personalized thing being the salutation, "Dear Jim." I am sure this same letter has gone out to many other Jims all over the country.

Now, there is nothing wrong with the U. S. Army being on its toes and the different services trying to attract young men to their particular branch. They've got a cinch, because they know the boys are going to have to decide in favor of one or the other. So, like you and me, they are trying to do a selling job. In days of yore when crises were not permanent boys decided what business they wanted to go into.

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NOW HERE IS WHAT I OBJECT TO—THE APPROACH that was used in trying to encourage my son to join the Air Force. There was nothing wrong with making the job sound glamorous, but when they told my boy in no uncertain terms that he would be eligible for retirement in 20 years, that made my blood boil. They knew they were approaching an 18 year old. In other words, they were saying, "Jim, when you are 38 years old you can retire and the government will take care of you for the rest of your life."

Can you imagine a man wanting to retire at 38? These boys just out of high school can add 18 and 20 and come up with so-called "guaranteed security" at 38. What do you suppose this does to their young minds, having a proposition such as this dangled in front of them? Does anybody ever take the time to tell them that the country wasn't built by men who retired at 38? Do they stop to realize that somebody who is not in the government service is going to have to pay for the proposition offered to them?

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IT IS ABSOLUTELY absurd that such a condition should exist in free America. Whatever type of ism you want to call this approach, it definitely is not that of Americanism. When an arm of the government grasps for the minds of our youth, planting ideas that will ultimately reduce us to charges of the state, whether it be time of war or "police action," it is high time we read and reread our Declaration of Independence and demand action.

The founders of our country wanted security when they left the oppression of the old world behind them. They found that security which abounded in the freedom of the wilderness. Their security was opportunity to freedom of mind and action and hardship. They wanted no guaranty. Their prayers to God were their luck, and at times, so the record indicates, their prayers went unanswered.

Today we have no wilderness except the masses of people. Herein lies the opportunity for every man. Out of the wants and desires of some 155,000,000 Americans is created a security for the man seeking opportunity in any field he might choose, but he probably won't reach his goal by the time he is 38. If I don't miss my guess our bright young boys are smart enough to know that the "retirement security" at 38, yes 48, is niggardly by today's standards of what a man can do on his own—but we who are 38 or past must teach our youngsters that true American security lies in the pursuit of opportunity.

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The Changing Panorama

Synthetic Fuel Need Considered

U. S. NEED for synthetic fuel from shale or coal is not urgent, and development of synthetics at least for the next ten years should be on laboratory and pilot plant basis and not through commercial plants. This is the convincing reply of Dr. Robert E. Wilson, chairman, Standard Oil Company (Indiana), to the current proposal by Interior Secretary Chapman for synthetic fuel plants. Wilson's opinions on the subject are entitled to high respect, as he is a scientist as well as an executive, and his company has long taken an active part in research and development of synthetics.

"Early construction of commercial plants for making gasoline and other liquid fuels from coal or shale, as urged by Secretary Chapman, would be most premature," declared Wilson.

Estimates show that the cost to the consumer of products made from either coal or shale would be substantially higher than the cost of the same products made from petroleum. Shale is presently much more attractive than coal. To even approach an economic operation, however, the shale installation would have to be on a tremendous scale and would involve a large pipe line to consuming centers, and major expenditures for housing and water supply.

No reduction in the rate of finding petroleum is indicated, said Wilson. On the contrary, the rate of finding is increasing, and oil is being found faster than it is being used, he added. Also, various other factors push far into the future the time when oil from coal or shale will be needed. Methods of finding and producing oil are being constantly improved. In addition to the 32 billion barrels generally counted as U. S. proved reserves, the location of more than 100 billion barrels is known, being in existing fields but not now recoverable by present methods at current prices. Of this additional oil, perhaps 65 billion barrels may eventually be recovered by secondary methods, which are constantly being developed.

"As still another cushion against future shortage," Wilson pointed out, "large amounts of residual fuel oil could be hydrogenated to make gasoline and other more valuable products.

"The logical way for coal to begin to supplement oil reserves is under the boilers of industrial power stations, where it is almost competitive with oil at the present time." This is an especially important point in Wilson's statement.

Speed-Up Is Sought On Oil Statistics

SPEEDING UP of the release of the government's monthly statistics on the petroleum industry is being attempted, and cooperation by oil companies is essential for the effort to succeed. The U. S. Bureau of Mines bases its "Monthly Petroleum Statement" and its monthly report on "Natural Gasoline and Allied Products" upon reports submitted by refining and other oil companies. More prompt filling out and mailing of the questionnaires is urged.

Heretofore, the "Monthly Petroleum Statement" has been released approximately two months after the end of the month covered by the report. This lateness is due primarily to delay by oil companies in submitting figures to Washington.

If oil companies will return the questionnaires for a given month to Washington by the 25th day of the succeeding month, as asked on the forms, then the bureau's report can be released by the 5th of the second month, it is hoped.

Thus the report for May, which actually was released about the end of July, could have been released about July 5, under the speed-up that is sought.

The American Petroleum Institute and other petroleum industry associations are joining with the Bureau of Mines in an effort to get oil companies to do everything they can to bring about earlier reporting. It is to the advantage of each oil company to cooperate in this effort, as the earlier release of the industry statistics would greatly increase their usefulness.

Royalty Owners Delaying Project

WORK ON THE proposed pressure maintenance project for the Scurry County Reef fields, West Texas, is being held up by delay of a minority of royalty owners in signing the voluntary unitization agreement under which the plan would be carried out.

Operators contemplate large expenditures to purchase and install equipment for injecting water and gas into the reservoir, thereby increasing the field's ultimate production. The field is at the right stage of development for a unitization program, and much higher production can be obtained through the plan.

The proposed unitization agreement is being circulated by representatives of more than 30 operating companies that are advocating a program of pressure maintenance to be operated under a unitization plan that will extract a considerably greater quantity of oil from the Kelley-Snyder and Diamond M fields of Scurry County. Some 250 separate leases in the fields, producing from 47,000 acres on which there are some 1200 oil wells, are involved.

Approximately 52 percent of the nearly 3000 royalty interests involved in the project have already signed the unitization document. Sixty five percent of the royalty interests' signatures are required and are now being solicited.

With signatures of 75 percent of operators owning working interests in the field required to further the unitization project, the Scurry Area Canyon Reef Operators Committee's landmen report that lessees operating more than 86 percent of the unit area already have signed the unit agreement. In addition, other lessees owning substantial interests have committed themselves to the execution of the agreement.

Similar programs have been successfully adopted in other fields. But in many other fields, such programs were impossible because the pressure maintenance programs were not started while the areas were still in the flush stages of production.

Report from the Observatory

Economic Outlook Less Favorable

By RAY L. DUDLEY, Publisher, and WARREN L. BAKER, Editor

BOOSTING OF PRODUCTION in Texas by an unexpectedly big amount in September is a matter of concern. This indicates both producers and refiners are to operate at peak rate in the coming month. Substantial reversal to the industry's fairly good current economic position could result, especially since the rate of growth in demand continues to slow down.

The industry will need to watch September trends with care so as to guard against the possibility of accumulating excessive stocks of both crude and refined products.

A particularly troublesome element is the improper balance in location of both crude and refined product inventories. West Texas and Mid-Continent areas have an oversupply, while the supply in the Gulf Coast and Eastern Seaboard is very tight. The Mid-Continent area could develop into a soft spot under conditions indicated for September.

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CRUDE STOCKS are in fairly good over-all position. Heavy drafts that totaled 13 million barrels during the past month reduced total U. S. crude inventories to 270½ million barrels by mid-August, in contrast with the excessive level of 288 million barrels which accumulated during the refinery strike. However, the 260,000 barrel per day increase in Texas production in September will materially slow down further drafts on stocks.

The disturbing element in the crude picture is the maldistribution of stocks. West Texas and Mid-Continent crude inventories have been reduced but little from the excessive build-up created during the refinery strike. Enlarged production in September will further aggravate the situation, West Texas' allowable having been increased by 30,000 barrels per day. Delay in completion of new pipe lines from West Texas due to the steel strike, means no enlargement in West Texas outlets can expect to be finished until after the first quarter of 1953. Until new transportation facilities are completed the West Texas crude situation is going to be tough.

Although U. S. crude stocks currently are 18 million barrels greater than a year ago, most of the gain has been in West Texas and the Mid-Continent area (Oklahoma, Kansas, Illinois and Indiana) crudes. West Texas stocks are 7½ million barrels above a year ago and Mid-Continent inventories are 3½ million barrels greater. The increase in West Texas' September allowables darkens the outlook. While helping to ease the tight supply conditions in the Gulf Coast and East Coast regions, it will aggravate the oversupply already existing in the West Texas and Mid-Continent regions.

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GREAT IMPROVEMENT in the refined product stock picture since the strike is dimmed only by improper location of inventories. Again the situation is that of heavy stocks in the Mid-Continent and a need for more inventories in the Gulf and East Coast regions.

The increase in total distillate inventories since the refining strike has been a bright spot in the industry's outlook. Although 8 million barrels less than in 1951 at the end of May, they had moved ahead of year ago levels by 6½ million barrels by mid-August. They can still stand some additional growth in view of anticipated higher demand this coming winter.

However, these stocks also are not properly located. Gulf and East coast inventories are about equal to a year ago, most of the gain in supply occurring in the Mid-Continent. While there is urgent need for substantial additions to these stocks in the Gulf and East coast regions, they should not be enlarged by any substantial amount in the Mid-Continent. Should refiners in the Mid-Continent reduce operations to prevent excessive distillate supplies, they would add to the possibility of too much crude in this region.

Resumption of steel mill operations, which account for about 10 percent of the total residual fuel demand, has had a noticeable effect on heavy oil supplies. Stocks the end of July were 5¼ million barrels higher than a year previous, but by mid-August had narrowed to 3½ million barrels over the like period of 1951. The threat of a coal strike has been an additional inducement for switching to fuel oil.

Gasoline stocks have continued to show improvement under the influence of high refining operations. In mid-August they were 10½ million barrels less than a year ago, in contrast with being 15 million less in mid-July than a year previous.

GOOD NEWS!

GOODALL rotary hose is now available through

ALL* SUPPLY STORES

Yes, for the first time in history, you can now buy Goodall Long-Life Rotary Hose through all supply stores. Goodall (the only rotary hose with the built-in Barney Coupling) has eliminated the cause of more than 90% of rotary hose failures . . . and is equipped with the only coupling that can be reset to save your hose from the scrap heap. That's why we would like to suggest that you tell your supplier you want Goodall the next time you need rotary hose. It costs no more than ordinary hose!

GOODALL RUBBER COMPANY
TRENTON, N. J

GOODALL RUBBER COMPANY OF TEXAS: Houston, Texas.
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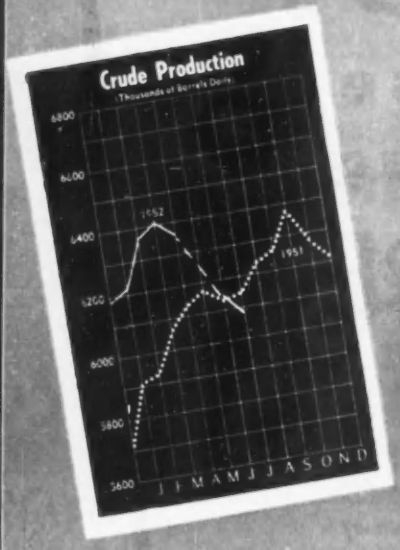
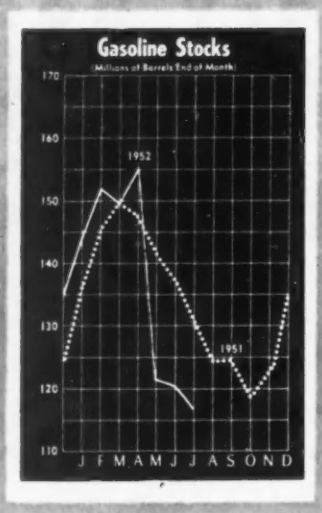
GOODALL RUBBER COMPANY: New York, Philadelphia, Pittsburgh, Chicago, Denver, St. Paul, Detroit.
EXPORT: Goodall Rubber Company, Trenton, N. J.
STOCKING DISTRIBUTORS: Houston Oil Field Material Co., Wilson Supply Co., Iverson Supply Co.

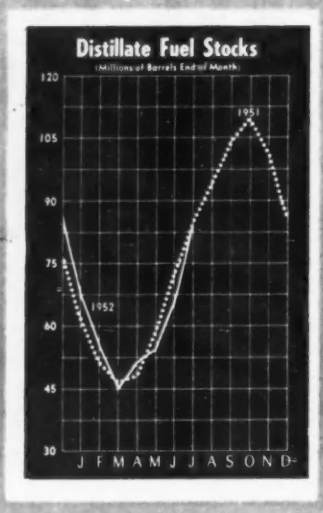
*Through all supply companies that maintain field stores.

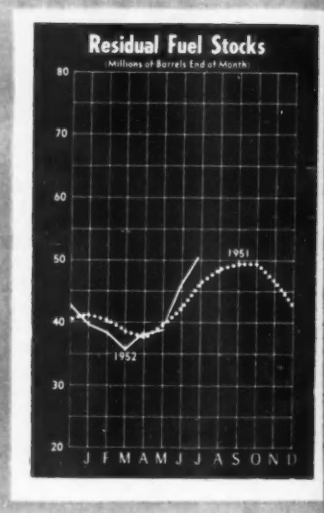
Petroleum T

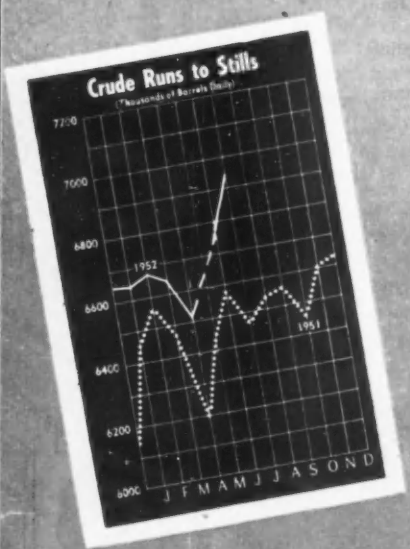
By CECIL W. SMI ORLI











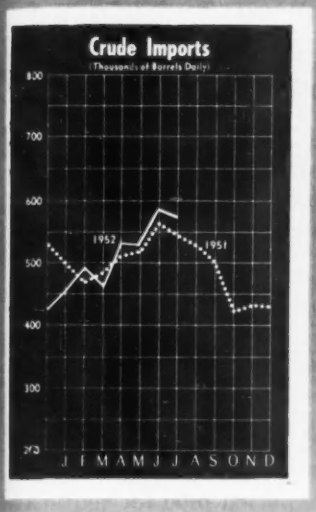
U. S. Crude Production by States

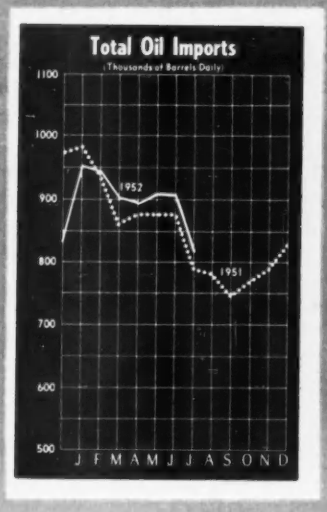
(THOUSANDS OF BARRELS)

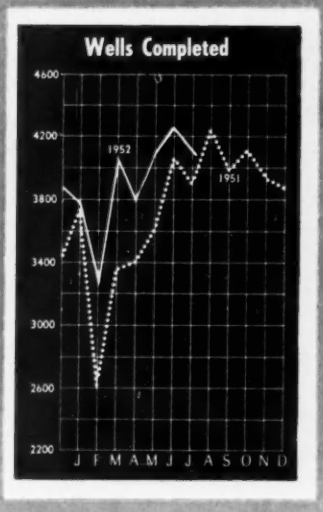
STATE or DISTRICT	DAILY AVERAGE PRODUCTION July, 1952	June, 1952	July, 1951	% Diff. July '51-'52	TOTAL PRODUCTION First Seven Months 1952	1951	% Diff. '52-'51
Alabama	2.7	2.7	3.0	— 10.0	555	604	— 8.1
Arkansas	80.6	80.3	82.0	— 1.7	17,246	17,312	— 0.4
California	985.5	987.6	970.5	+ 1.5	208,968	204,649	+ 2.1
Colorado	83.5	81.3	69.0	+ 21.0	16,704	15,566	+ 7.3
Florida	1.7	1.7	1.7	.....	363	343	+ 5.8
Illinois	167.0	170.8	159.9	+ 4.4	34,137	34,222	— 0.3
Indiana	32.5	32.9	30.3	+ 7.3	6,682	5,759	+ 16.0
Kansas	324.3	296.5	309.3	+ 4.8	63,628	65,881	— 3.4
Kentucky	33.6	33.9	32.0	+ 5.0	7,365	6,247	+ 17.9
Louisiana	673.4	665.4	629.5	+ 7.0	137,743	133,991	+ 2.8
North Louisiana	124.1	124.4	114.2	+ 8.7	25,638	25,304	+ 1.3
South Louisiana	549.3	541.0	515.3	+ 6.6	112,105	108,687	+ 3.1
Michigan	37.4	36.8	37.9	— 1.3	7,901	8,279	— 4.6
Mississippi	96.5	97.2	100.6	— 4.1	21,109	21,650	— 2.5
Missouri	0.1	0.1	0.1	.....	14	17	— 17.7
Montana	26.6	25.2	25.2	+ 5.6	5,224	5,187	+ 0.7
Nebraska	7.1	6.5	5.9	+ 20.3	1,197	1,544	— 22.5
New Mexico	163.4	162.6	143.8	+ 13.6	32,421	30,052	+ 7.9
New York	13.3	13.3	11.8	+ 12.7	2,596	2,464	+ 5.4
North Dakota	3.2	2.5	.....	.....	293	3	+9666.7
Ohio	8.7	8.9	8.8	— 1.1	1,831	1,848	— 0.9
Oklahoma	519.5	514.1	512.4	+ 1.4	108,835	107,595	+ 1.2
Pennsylvania	29.1	28.7	29.9	— 2.7	6,473	6,676	— 3.1
Tennessee	.....	.....	.....	.....	7	8	— 12.5
Texas	2,605.7	2,695.5	2,782.4	— 6.4	577,951	574,083	+ 0.7
Dist. 1—South Central	31.9	31.8	33.2	— 3.9	6,839	7,004	— 2.4
Dist. 2—Middle Gulf	140.2	147.2	164.0	— 14.5	32,498	34,288	— 5.2
Dist. 3—Upper Gulf	436.2	461.3	491.9	— 11.3	97,776	104,028	— 6.0
Dist. 4—Lower Gulf-S.W.	229.3	240.9	257.3	— 10.9	52,193	53,549	— 2.5
Dist. 5—East Central	50.3	54.2	54.9	— 8.4	11,744	10,757	+ 9.2
Dist. 6—Northeast	380.3	389.2	390.4	— 2.6	80,335	82,158	— 2.2
Dist. 7-B—North Central	91.0	92.5	82.0	+ 11.0	18,609	17,364	+ 7.2
Dist. 7-C—West Central	140.9	137.8	107.0	+ 31.7	28,641	20,589	+ 39.1
Dist. 8—West	862.0	895.2	958.2	— 10.0	197,096	193,569	+ 1.8
Dist. 9—North	162.4	163.1	158.0	+ 2.8	33,935	32,495	+ 4.4
Dist. 10—Panhandle	81.2	82.5	87.4	— 7.1	17,372	18,874	— 8.0
Utah	4.2	4.2	3.6	+ 16.7	890	780	+ 14.1
Virginia	0.1	0.1	0.1	.....	10	7	+ 42.9
West Virginia	6.9	7.2	7.8	— 11.5	1,514	1,598	— 5.3
Wyoming	182.1	176.1	183.2	— 0.6	37,643	39,738	— 5.3
Total United States	6,088.6	6,132.0	6,140.7	— 0.9	1,299,300	1,286,103	+ 1.0

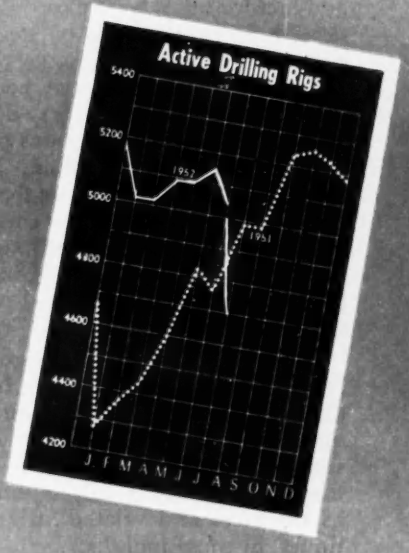
Trends in U. S.

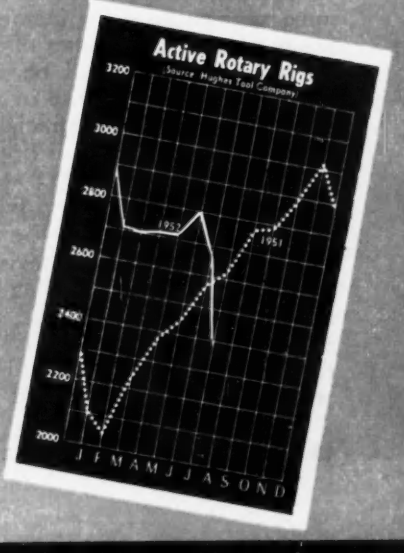
WORLD OIL Staff











Crude Oil and Refined Products Trends

(THOUSANDS OF BARRELS)

MONTH	CRUDE OIL			GASOLINE		DISTILLATE FUEL		RESIDUAL FUEL		DAILY IMPORTS	
	Production Daily	Runs to Stills Daily	Stocks End of Month	Production Daily	Stocks End of Month	Production Daily	Stocks End of Month	Production Daily	Stocks End of Month	Crude Oil	Total Oils
1950:											
May	5,143	5,535	239,877	2,647	121,035	997	42,739	1,063	39,482	439	766
June	5,378	5,655	242,287	2,748	114,074	1,037	53,679	1,069	40,124	498	838
July	5,484	5,882	240,270	2,835	111,055	1,040	62,555	1,140	42,165	486	806
August	5,665	6,067	237,393	2,932	107,067	1,089	68,426	1,148	40,979	501	839
September	5,888	6,059	242,311	2,849	105,748	1,180	78,270	1,178	41,966	525	859
October	5,900	6,077	246,424	2,875	105,764	1,217	85,643	1,250	45,004	510	896
November	5,891	6,085	250,016	2,859	109,005	1,218	86,113	1,240	45,048	466	891
December	5,719	6,143	248,463	2,879	116,769	1,343	71,948	1,306	40,750	530	974
1951:											
January	5,907	6,450	243,107	2,962	136,145	1,427	62,163	1,368	41,251	499	977
February	5,930	6,562	235,247	2,906	145,184	1,419	51,348	1,382	40,716	468	937
March	6,052	6,469	233,824	2,908	149,679	1,327	46,744	1,348	38,366	483	861
April	6,127	6,183	243,180	2,821	147,679	1,171	48,239	1,230	37,623	511	871
May	6,170	6,436	248,418	3,031	141,658	1,210	59,272	1,265	39,879	518	876
June	6,130	6,575	248,170	3,100	137,009	1,254	72,140	1,277	42,398	563	876
July	6,141	6,462	250,847	3,091	130,931	1,228	84,282	1,275	46,320	546	788
August	6,232	6,539	254,276	3,114	124,202	1,237	94,028	1,226	48,365	529	780
September	6,261	6,558	254,900	3,127	124,530	1,282	104,082	1,228	49,608	500	744
October	6,375	6,446	262,266	3,105	118,864	1,295	109,544	1,224	49,573	421	769
November	6,272	6,609	261,100	3,130	122,723	1,358	101,666	1,304	46,491	425	802
December	6,182	6,646	255,783	3,150	134,867	1,442	86,619	1,313	42,853	423	834
1952:											
January	6,217	6,640	254,007	3,094	144,339	1,456	66,969	1,338	39,523	488	951
February	6,367	6,673	255,900	3,109	151,912	1,528	55,369	1,322	38,295	491	940
March	6,388	6,640	259,126	3,069	160,689	1,400	48,750	1,274	37,971	510	947
April	6,429	6,435	270,679	2,995	151,890	1,312	51,634	1,253	38,561	539	922
May	5,107	4,905	290,813	2,295	123,656	982	51,648	979	38,821	545	951
June	6,132	6,777	286,291	3,166	120,511	1,394	65,114	1,248	45,314	581	901
July	6,089	6,952	276,937	3,305	116,798	1,449	84,889	1,252	51,339	578	819
July, 1952: Change:											
In Month	—43	+175	—9,354	+139	—3,713	+55	+19,775	+4	+6,025	—3	—82
In Year	—52	+490	+26,090	+214	—14,133	+221	+607	—23	+5,019	+32	+31
Week Ended:											
8-16-52	6,278	7,177	270,566	3,304	115,979	1,477	95,280	1,246	51,959	516	767
8-18-51	6,227	6,470	252,158	3,075	126,286	1,228	88,721	1,206	48,293	601	822

Monthly News Analysis

Indication of General Business Decline Seen

Some oil industry market analysts think that the unfavorable behavior of the market for residual fuel oil may foreshadow a decline in business activity in general. Consumption of heavy fuel oil is closely linked to industrial production generally, and softening of residual demand and prices apparently has been based on declines in use of fuel by ships, railroads, public utilities, paper mills and other industries. In mid-August, heavy fuel oil was being offered in cargo lots on the Gulf Coast at $1.50 per barrel, after having held steadily at $1.75 a barrel for about a year.

The long steel strike adversely affected demand for residual fuel oil. Steel mills are substantial users of the product, and so are many other mills and factories that were closed down or slowed down for lack of steel supplies. However, even greater volumes of residual fuel oil have been left without market by other developments in the general business picture, outside the steel situation, in the opinion of some market analysts. An important example cited is the loss of market for bunker oil through the slowing down of shipping. Sales for bunkering ships are reported off substantially.

U. S. Bureau of Mines figures for May showed lagging demand for residual fuel oil by electric power plants and railroads as well as other consumers, and continuance of lower demand in June and July is indicated, as the steel and related strikes continued in those months.

Along with the above cited unfavorable trends in the residual fuel oil market, however, there are also some more encouraging factors. Helping to eliminate surpluses of residual in coming months will be the customary seasonal increase in demand in fall and winter. Artificially high industrial production has been made a necessity, following the steel strike, and this will stimulate residual demand at least temporarily.

In its recently released revised forecast of petroleum demand and supply for 1952, the U. S. Bureau of Mines estimated that the total demand for residual fuel oil would be above last year by 8/10 of 1 percent for the third quarter of this year and by 4.4 percent for the fourth quarter. These increases would occur in spite of substantially lower exports. For domestic consumption, the expected increases are 4.7 percent for the third quarter and 5.8 percent for the fourth quarter.

These increases would be somewhat less than the gains forecast for all oils in the aggregate. For the third quarter, total demand is expected to be 3.4 percent larger than in the like period last year, with exports down 30.8 percent but domestic consumption up 6.3 percent. For the fourth quarter, the bureau anticipates an increase of 6.1 percent in total demand for all oils, with exports off 26 percent but domestic demand up 8 percent.

Plans to Bolster Reserves Dealt Big Blow by Strike

Even the major ill effects of the steel strike which will be felt for the remainder of this year and through at least early 1953 are minor upon comparison with the serious setback in the over-all long-range plans for oil's expansion to provide urgently needed reserve capacity. Barring an unexpected reduction in domestic oil demand, no sizable volume of excess capacity now can be expected for the next several years.

Petroleum Administration for Defense officials put the loss of steel during the 75 days of strikes at the equivalent of three months' production. That means the oil and gas industry, for the remainder of 1952, must operate on steel allocations granted to provide for only the first nine months of the year.

Best estimates are that mills will require the last three months of the year to produce steel authorized, but not delivered, for second and third quarter operations. The only additional tonnage expected through PAD channels will be a limited supply of conversion steel and pipe issued from emergency wildcat (M-6A) stocks as they are rebuilt.

Rate of imported pipe for the first five months of 1952 indicates a year's total approximating the 239,500 tons of pipes and tubes imported in 1951.

What did the steel strike mean to the oil industry? Briefly, this is PAD's summation:

- Loss of 8000 domestic and 1000 foreign wells scheduled to be drilled in the latter part of 1952.

This confirms the estimate made by WORLD OIL in its Mid-Year Outlook Issue that tubular good shortage would cut U.S. completions this year to 42,034 wells, or 8000 less than the

Anglo-Iranian Oil Company Explains Position

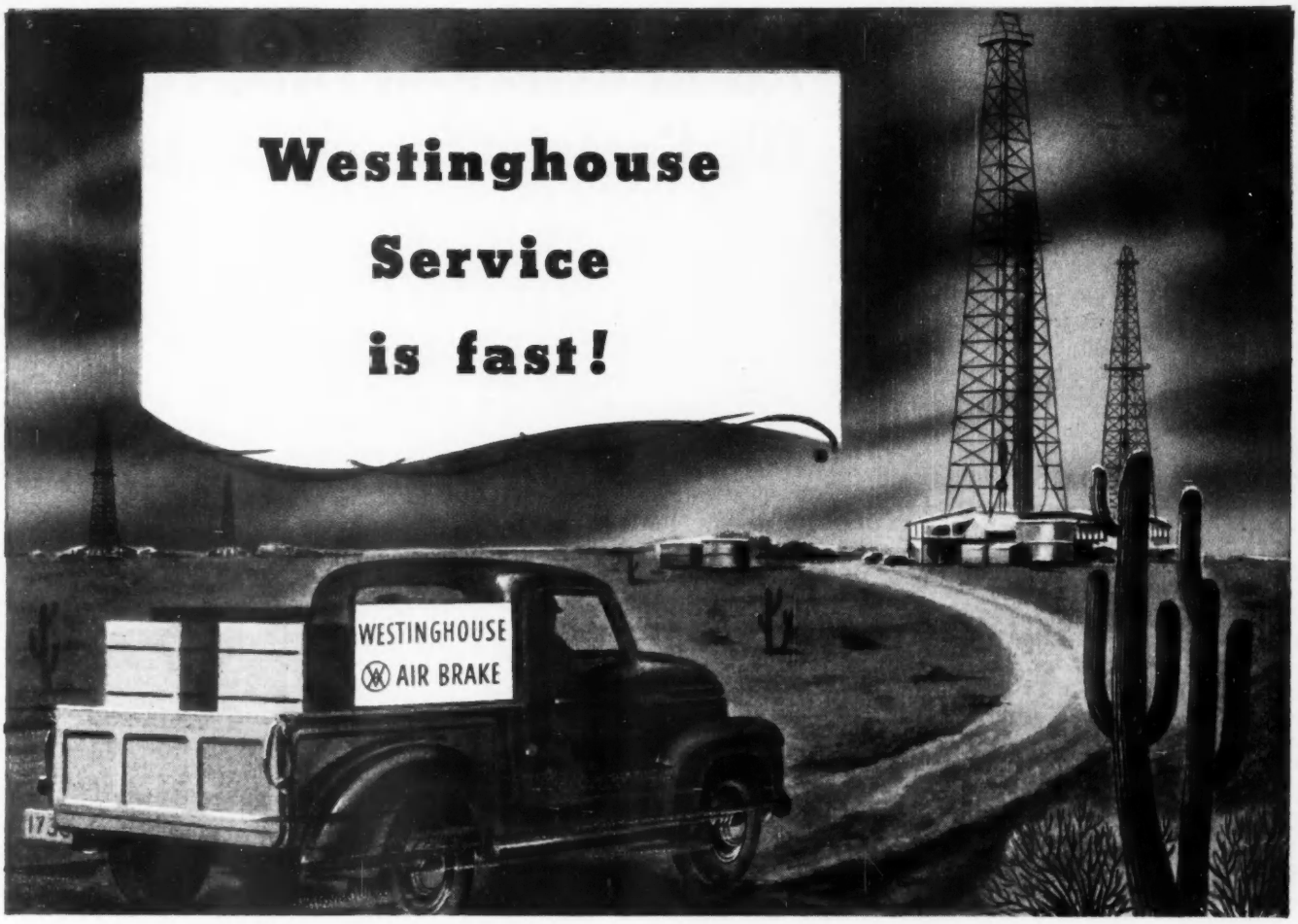
August 13, 1952

The Editor, WORLD OIL:

The section on Iran in the July 15th International Issue of WORLD OIL contained refinery and pipe line listings which might confuse your readers regarding the ownership of these installations. Consequently, we feel we should make it clear that the Anglo-Iranian Oil Company holds legal title to these properties and to the crude oil and products derived from its concession area in Iran by virtue of its convention of April 29, 1933, with the government of that country.

As the company has pointed out in press announcements and as Winston Churchill explained in the British House of Commons on July 23, the decision of the International Court at The Hague that it had no jurisdiction in the oil dispute between Britain and Iran does not in any way impair the Company's legal right to their expropriated properties in Iran and to the oil and oil products derived or to be derived from the concession area.

ANGLO-IRANIAN OIL CO., LTD.
Britannic House
Finsbury Circus
London, E. C. 2, England



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annual completion rate indicated in the first six months of the year.

• The delay for at least one quarter the construction of crude oil pipe lines with a capacity of more than a million barrels daily and of products lines with a capacity of 400,000 barrels daily. This equals 63 percent of total pipe line projects scheduled during the last half of 1952.

• An estimated 35 percent loss in line pipe allocations for natural gas lines which originally totaled 826,000 tons that would have been scheduled for delivery in the second, third and fourth quarters. Of that, 701,000 tons of line pipe were scheduled for critical winter facilities.

• Construction of products-storage facilities to handle 12.5 million barrels has been delayed at least one quarter. Consequently, these facilities, needed for the winter heating season just ahead, will not be available.

Steel strike effects have not been limited to U.S. About 25 percent of Western Canada's drilling rigs have been shut down for lack of tubular goods. Therefore, total 1952 completions will fall short of expectations. Ever alert, though, to the need for continued activity, some Canadian operators are shifting from development well completions to wildcat operations.

PAD's summation, dark as it is, still depended on two factors:

1. That steel production, at capacity levels in mid-August, would not be interrupted again.

2. That military needs will be filled to the extent that by the first quarter of 1953 allocations to the oil industry could be resumed on about the same levels as in the first three quarters of 1952.

But there's another fly in the ointment. Loss of iron ore shipments over the Great Lakes resulting from a strike in that industry in July seriously threatens full production of steel mills during the winter months. That setback will be eased somewhat by increased movements of ore during the final months of the shipping season to make up some of the stockpile losses suffered.

The immediate outlook, though, is for noticeable ore shortages in the January-March period.

At full capacity operations for the remainder of 1952, based on production levels of the five months prior to the steel strike when mills were running at and above rated capacities, the indicated 1952 yield of tubular goods would amount to about 1,375,000 tons. That is the equivalent of PAD pipe allocations for the first three quarters of the year.

Administration Drags Out Oil Cartel Charges Again

IT WAS hot during August. Even so, the Truman administration decided it was time again to heat up the oft-repeated, but never proved, charges of an "international oil cartel" against five American companies, their foreign subsidiaries and two British firms.

Taking the approach of a hunter stalking big game, the field had been well baited. Supposedly responsible Federal officials for months had fed Washington newspaper correspondents loose charges and "planted" interpretations and conclusions from the contents of a Federal Trade Commission report — safely marked "secret" until August 24—on the alleged misdeeds in international oil operations dating back for a quarter of a century. Final publication of the 378-page report was a dull anti-climax to the great "hunt" that reached its greatest momentum on several fronts:

• Administration leaders in Congress called for complete investigations.

• The Justice Department, whose head—Attorney General McGranery —announced on the eve of the Democratic Party convention that indictments against the "cartel" group would be sought, subpoenaed the records of 21 companies (the seven leading firms, their subsidiaries and other American companies) pertaining to international oil operations between Jan. 1, 1928, and July 15, 1952. These subpoenas were returnable before a grand jury in Washington in September unless a requested delay should be granted.

• Democratic Vice Presidential Nominee Sparkman, who claimed credit for bringing the FTC report out from under its mantle of secrecy, offered to give ear to the oil companies which wished to offer "rebuttal" to the commission's report.

• The Mutual Security Agency, headed by unsuccessful Democratic presidential candidate Averell Harriman and a leading Democratic party power in New York, revived its perennial attack on Middle East oil prices and "overcharges" to the American taxpayers by Middle East producers.

• And the self-described key to the Democratic campaign, President Truman, replied to a press conference question that he knew nothing of any "mess" in Washington.

The Democratic party's race for the presidential election was on.

Probably it is purely coincidental, but the famous "Mother Hubbard" suit of the U. S. Justice Department also was filed on the eve of a presidential election—Sept. 30, 1940, when the late Franklin D. Roosevelt was seeking his third term in the White House. This broadside against 367 oil companies and the American Petroleum Institute was dropped by the Justice Department June 6, 1951, in favor of regional suits, one of which is now pending.

At that time, H. Graham Morison, then assistant attorney general in charge of the anti-trust division, made clear before a congressional committee that the oil industry would continue to be a major target of the division. And, according to press accounts, the division was not getting "soft" with reference to the oil industry.

The first half of the massive ten-chapter report of the Federal Trade Commission reviews the general history of acquisition of foreign petroleum concessions, drawing numerous implications of force and coercion and omitting some factual details that some of the largest American companies were urged by the U. S. government to compete with British companies in international oil operations to insure petroleum for the U. S. From that, the report using its own conclusions frequently traces the purported arrangements and agreements among the seven major foreign producers to regulate and divide the flow of the world's oil and sharing of markets. The final chapter covers the so-called international basing point system of price petroleum and, following the pattern of MSA, charges discrimination against European purchasers of Middle East oil, which in the final run was tied to a fraud on the American taxpayer through the Marshall Plan financing of European recovery.

Reviving its original charges dating back to 1949, the latest attack from Mutual Security Agency in a 26-page memorandum to the Senate Small Business Committee described what

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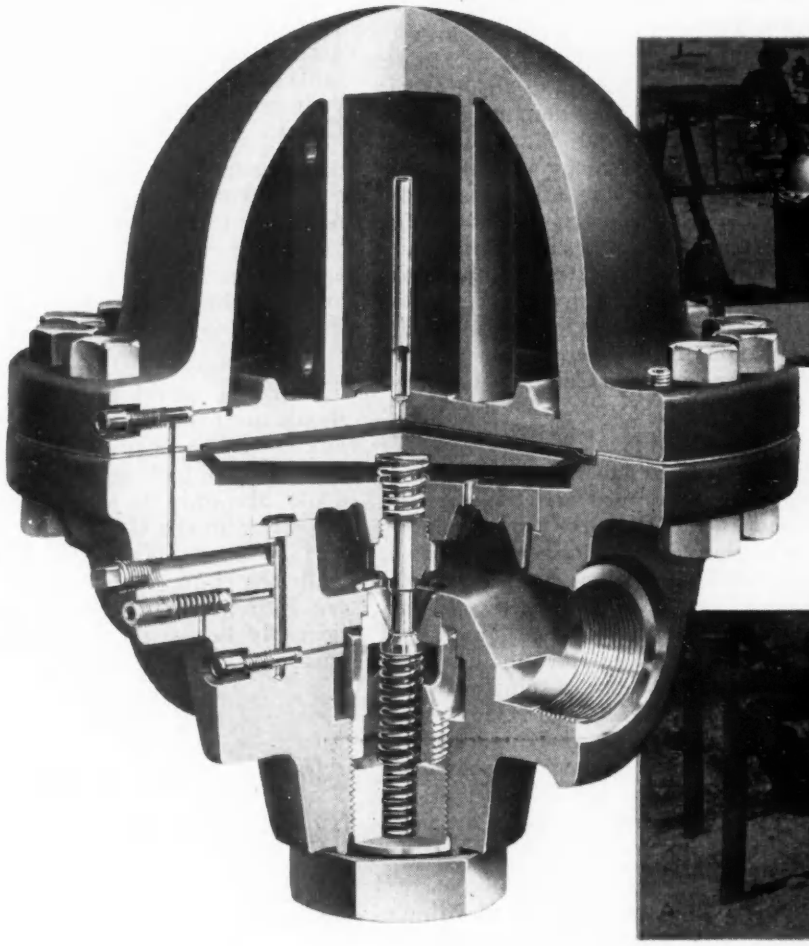

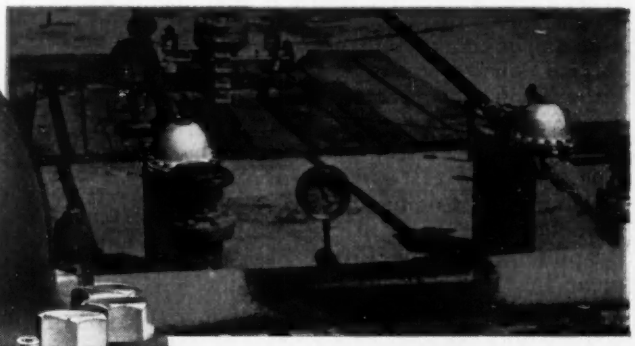

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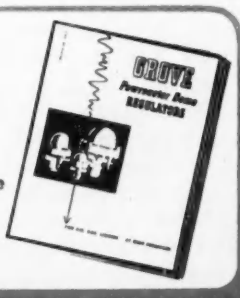

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the agency termed a "two price system for crude oil."

MSA charges that its predecessor—Economic Co-operation Administration—in 45 months of crude oil purchasing in the Middle East was overcharged in the amount of "over $50 million" due to widespread price discrimination of five companies. It cited the five companies as Standard Oil Company (New Jersey), Standard Oil Company of California, Socony-Vacuum Oil Company, The Texas Company and Gulf Oil Corporation. As presented to the Justice Department last April, MSA stated the "overcharges" occurred between May 3, 1949 and Dec. 31, 1951.

These same companies, along with others, received Justice Department subpoenas to appear before a federal grand jury. The other firms subpoenaed are: Anglo-Iranian Oil Company, Ltd.; Iraq Petroleum Company, Ltd.; Shell Trading & Transport Company; The Royal Dutch Petroleum Company; Atlantic Refining Company; Pan American Petroleum & Transport Company; Standard Oil Company (Indiana); The Superior Oil Company of California; American Independent Oil Company; Kuwait Oil Company; Arabian American Oil Company; Standard-Vacuum Oil Company; Near East Development Company; Bahrein Petroleum Company, Ltd.; California Texas Oil Company, Ltd., and Conorado Petroleum Corporation.

MSA's argument with Middle East suppliers of Marshall Plan oil to Western Europe is based around the point that the price charged for these sales should be the same price charged on inter-company sales of crude. The general disparity, according to MSA, is that U. S. financed crude oil shipments to Western European nations were billed at a price of $1.75 f.o.b. Persian Gulf, while Middle East producers in sales to affiliated and parent companies for shipment to the U. S. under long-term contracts charged a price of $1.43 a barrel, f.o.b. Persian Gulf.

MSA and ECA, it is charged, bought oil under the Foreign Aid Appropriation Act of 1949, which provided that no funds from that appropriation could be used to purchase commodities at prices higher than the market price prevailing in the U. S. at the time of purchase. Under this clause, MSA charged that Middle East sales to Marshall Plan countries should be billed at the "market" price of $1.43 a barrel and demand refunds early in 1951 for "overcharges."

The Justice Department last March sent demand letters to the companies involved and, when there was no compliance with the demands, MSA discontinued financing of shipments of Middle East oil to Western Europe last June.

The over-all MSA attack on Middle East prices is long and involved. It dates back to the summer of 1948 when first Marshall Plan sales were started. It is also an attack on the method of arriving at a price from Persian Gulf points, and over the differences in charges for shipments to various Western European destinations. Another set of charges involves the crude oil prices posted at Sidon, Lebanon, by the purchasers of Arabian American Oil Company's crude—Standard of Jersey, California Standard, Socony and Texaco.

The basic pricing formula for Middle East crude was arrived at on the theory that Europe would always have some dependence on Caribbean oil supplies and that Middle East oil should be competitive with Western Hemisphere petroleum. The actual formula is derived from the crude oil price f.o.b. Caribbean, plus transportation at U. S. Maritime Commission rates to the United Kingdom, less tanker charges from the Persian Gulf to the U. K. at USMC rates, less 4 cents a barrel refining value differential between Persian Gulf and Caribbean crude.

First ECA purchases of Middle East oil were at $2.12 a barrel, f.o.b. Persian Gulf ports. The posting was lowered to $1.75 in two changes by 1950. With the lower price, ECA felt, according to the report, that Middle East producers were realizing the same prices on oil shipments to Western Europe and the U. S.

The agency later learned that all shipments to the Western Hemisphere since May 3, 1949, had been at a uniform price of $1.43 a barrel, f.o.b. Persian Gulf. It was at this point that a refund was asked—the date ECA withdrew its waiver permitting different prices to be charged to ECA than to U. S. customers. Each participating company rejected the ECA's claim that a refund was due and that in no way could prices realized on inter-company sales be the competitive price for Persian Gulf oil. The last $1.75 barrel price, which the suppliers argued was the competitive quotation, was charged by all Persian Gulf suppliers on non-company sales.

Also part of MSA's claim for refund is crude oil purchased by Western European nations participating in the Marshall Plan at the Sidon terminus of the Trans-Arabian Pipe Line. The price posting for this oil at $2.41 a barrel—the Persian Gulf price of $1.75 plus 66 cents a barrel transportation charges—represents no savings, according to the MSA report, over tanker shipments around the Arabian peninsula and through the Suez Canal.

The companies, MSA charged, held the 66-cent-a-barrel pipe line transportation levy was necessary because "the large risks inherent in the Mideast made it essential for them to amortize the cost of the pipe line as quickly as possible."

ECA, it was stated, argued that the 66 cents a barrel pipe line charge should meet the test of the ECA regulations—as low a price to ECA as to the U. S. A look at the companies' books, according to MSA, found that shipments to the U. S. were billed at $1.43 a barrel from Persian Gulf while the "pipe line charge on Western Hemisphere shipments was considerably below the 66 cents being charged ECA."

All-Time High Allowable Set By Texas Rail Commission

The Texas Railroad Commission named an all-time high allowable for 3,225,415 barrels per day for September. This was a surprise move that went along with the recommendations of refiners in most places outside of West Texas, where permitted production may exceed pipe line capacity this month.

The hike of 261,201 barrels per day over the August figure erased the previous record of 3,159,477 barrels per day set March 15. A two-day increase in the number of producing days accounted for the increase. The commission adopted at 22-day general schedule compared with August's 20 days generally and 19 for the East Texas field. For September, East Texas will continue on a 19-day schedule. Other fields on limited production will be Pantex, Duval County, 16; Pickston, Hopkins County, 6; Hawkins, Wood County, 15; Millican, Coke County, 9; and fields connected to Phillips Petroleum Company's Goldsmith gasoline plant in West Texas, 17 days.

Maston Nixon of Corpus Christi, president of Southern Minerals Corporation, appealed for at least 22 days' operation, saying his company could use 25 days' supply from its connections.

Completions Slowed By Steel Shortage

LOWERED drilling rates were beginning to become evident during July when the number of completed wells declined almost 3 percent from the year's high mark set during the preceding month. However, July's record was the second highest for the year, topping May, the previous runnerup, by eight new wells.

The pipe shortage brought on by the recent steel strike was beginning to be felt during July, but was only slightly reflected in drilling statistics. However, more serious effects will show during August and September, when wells that were not started because of lack of pipe would normally have been completed.

At the end of July, the year's total wells held a lead of about 10 percent over those recorded in the same period last year, the record year. That lead will certainly be narrowed and probably wiped out within the next few months, as the records begin to show the effects of the large number of stacked rigs. A count of active drilling rigs in the U. S. at the end of July showed a drop of almost 7 percent during the month, and they were also about 6 percent fewer in number than they had been a year earlier.

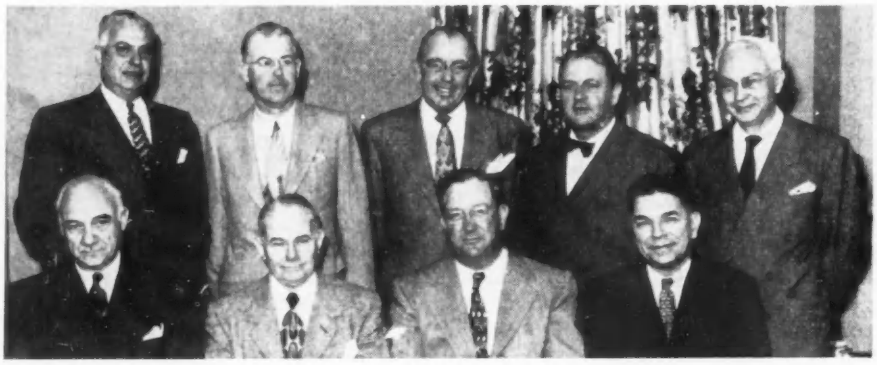
July's new wells totaled 4113 to lag behind June's 4235, but to slightly top May's 4105 new wells. Of the month's completed wells, 2096 were completed as commercial oil producers and they accounted for 51 percent of the total new wells drilled. A slightly better record was made during June, when 2180 oil producers amounted to 51.5 percent of the total. Including gas and distillate producers, all successful wells totaled 2386 during July for 58 percent of the total drilled, while in June, the peak month, 2544 producers represented 60.1 percent of all tests.

In seven months, 27,561 wells were completed this year against the 25,123 credited to the same period of 1951. That represented a gain of 9.7 percent for the current drilling campaign and was the greatest number of wells ever drilled in the first seven months of any year. Not only have the current operations been more active, but they have been slightly more successful percentagewise. This year, 14,400 oil wells have been completed and they amounted to 52.9 percent of the total new wells drilled. A year earlier, 12,881 oilers amounted to 52.2 percent of all wells. Including gas and distillate producers, all successful tests this year have totaled 16,460, or 60.5 percent of the total, and last year at the same time producers totaled 14,767, or 59.8 percent of all drilled.

Wells Completed in the United States During July, 1952, and First Seven Months, 1952

STATE or DISTRICT	MONTHLY COMPLETIONS, JULY, 1952									TOTAL COMPLETIONS				CUMULATIVE TOTALS January-July					Rigs in Operation (Drilling, Rigging-Up and Shut Down)		
	NEW WELLS																				
	Oil	Dist.	Gas	Dry	Water Input	Gas Input	Water Disposal	Total New	Total Drilled Deeper	July, 1952	June, 1952	July, 1951	Footage July 1952	Wells 1952	Wells 1951	Percent Diff.	Footage 1952	Footage 1951	July, 31, 1952	June, 30, 1952	July, 31, 1951
Alabama	3		2	5				10		10	7	4	68,834	38	35	+ 8.6	221,766	160,499	4	5	4
Arizona														1	2	— 50.0	3,544	3,320	3	3	2
Arkansas	20		1	15				36	1	37	39	44	135,166	230	225	+ 2.2	844,090	784,482	41	41	35
California	135		4	47				186	2	188	215	191	728,501	1,503	1,401	+ 7.3	6,114,420	5,365,065	247	257	253
Colorado	11			30				41		41	36	20	232,841	236	129	+ 82.9	1,295,576	622,846	32	29	30
Florida				2				2		2		1	11,857	6	2	+200.0	39,081	2,014		1	1
Idaho															1	—100.0		12,844	1	1	
Illinois	62			140				202		202	201	280	531,883	1,055	1,273	— 17.1	2,598,484	3,184,785	212	208	214
Indiana	43			83				126		126	122	149	243,472	712	637	+ 11.8	1,273,912	1,150,628	197	188	176
Kansas	208		38	197			2	445		445	387	396	1,553,420	2,626	2,327	+ 12.8	9,114,166	7,911,843	412	452	439
Kentucky	36		16	40				92		92	128	122	191,908	673	704	— 4.4	1,391,412	1,420,052	96	83	104
Louisiana	93	7	13	81				194		194	233	178	1,212,001	1,326	1,183	+ 12.1	8,870,413	7,723,957	217	215	227
North Louisiana	61	5	4	42				112		112	130	96	420,812	714	622	+ 14.8	2,659,353	2,423,045	66	58	73
South Louisiana	32	2	9	39				82		82	103	82	791,189	612	561	+ 9.1	6,211,060	5,300,912	151	157	154
Maryland			2					2		2	3	4	7,244	25	19	+ 31.6	99,073	74,090	16	19	26
Michigan	35		4	41				80		80	41	59	227,848	391	401	— 2.5	1,957,341	1,023,673	108	107	102
Mississippi	6	1		22				29		29	18	50	218,975	204	203	+ 0.5	1,477,526	1,314,434	36	35	37
Missouri			2	3				5		5	5		3,302	24	3	+700.0	25,297	658	2	3	6
Montana	8			13				21	1	22	31	34	79,216	133	142	— 6.3	408,988	317,292	64	61	57
Nebraska	7			4				11		11	15	11	56,918	100	82	+ 22.0	496,747	371,238	18	13	12
Nevada															2	—100.0		15,431	1		2
New Mexico	48		17	25				90	1	91	101	59	531,783	670	393	+ 70.5	3,639,063	1,831,988	144	188	117
New York	66				40			106		106	86	51	146,610	567	306	+ 85.3	789,143	435,368	115	105	63
North Dakota	2							2		2	9	3	17,140	28	4	+600.0	259,818	28,763	22	19	7
Ohio	35		14	28				77		77	105	97	158,505	557	514	+ 8.4	1,194,057	1,014,056	169	160	167
Oklahoma	255	1	13	168	14			451	12	463	560	421	1,731,054	3,432	3,159	+ 8.6	12,716,754	11,331,296	550	561	616
Pennsylvania	58		20	5	54	8		145		145	151	142	245,704	973	846	+ 15.0	1,653,972	1,474,384	266	268	262
South Dakota				1				1		1			3,980	2			12,413		4	3	1
Tennessee												4			6	—100.0		7,465	5	5	9
Texas	928	24	79	611	3	1	1	1,647	31	1,678	1,657	1,512	8,017,471	11,306	10,337	+ 9.4	53,960,840	44,560,729	1,393	1,685	1,651
Dist. 1 S. Central	40	1	1	25				67		67	66	37	176,047	423	342	+ 23.7	1,251,955	996,640	33	32	34
Dist. 2 Middle Gulf	22	5	7	34			1	69		69	68	54	452,596	499	436	+ 14.4	3,133,708	2,507,917	51	59	62
Dist. 3 Upper Gulf	71	7	5	48				131		131	161	146	913,074	1,084	912	+ 18.9	7,149,478	5,610,912	127	132	125
Dist. 4 L. Gul'-SW	68	11	19	49				147		147	136	169	880,997	1,028	1,015	+ 1.3	5,395,076	4,960,117	103	101	125
Dist. 5 E. Central	5		2	21				28		28	26	43	141,595	211	279	— 24.4	1,094,586	1,046,775	33	33	34
Dist. 6 Northeast	24		11	19				54		54	54	64	320,600	348	436	— 20.2	2,145,050	2,194,337	30	39	42
Dist. 7-B N. Central	108		2	129				239	1	240	285	245	729,543	1,706	1,585	+ 7.6	5,431,443	4,485,780	137	192	196
Dist. 7-C. W. Cent.	129		1	56				186	2	188	185	110	1,096,804	1,371	799	+ 71.6	7,964,481	3,500,262	214	269	173
Dist. 8 West	273		6	65	2			346	28	374	288	337	2,029,047	2,302	2,325	— 1.0	12,943,082	12,547,508	305	408	470
Dist. 9 North	166		4	149	1	1		321		321	303	256	1,081,239	1,932	1,757	+ 10.0	6,171,814	5,277,765	269	310	267
Dist. 10 Panhandle	22		21	16				59		59	85	51	195,929	402	451	— 10.9	1,280,167	1,432,716	91	110	123
Utah	1			8				9		9	1	3	55,696	35	15	+133.3	211,222	71,777	30	30	24
Virginia																					1
Washington																					1
West Virginia	4		30	6				40	2	42	62	57	133,987	347	351	— 1.1	1,045,602	1,016,206	210	201	220
Wyoming	32	1	1	29				63		63	56	77	320,551	361	421	— 14.3	1,845,649	2,074,130	79	91	123
Total U.S.	2,096	34	256	1,604	111	9	3	4,113	50	4,163	4,269	3,969	16,865,867	27,561	25,123	+ 9.7	112,660,069	95,308,813	4,694	5,037	4,989

12 years ago 12 men dedicated to best ideals of American business met and formed the AAODC . . .



Past presidents of AAODC and company affiliations at time of their service are, left to right, front row, J. E. Brantly, Drilling & Exploration Company, Los Angeles, 1941-42; N. H. Wheless, Wheless Drilling Company, Shreveport, 1943; A. H. Rowan, Rowan Drilling Company, Fort Worth, 1944; Howard P. Holmes, Two States Drilling Company, Dallas, 1945. Back row, right to left, William T. Payne, Big Chief Drilling Company, Oklahoma City, 1946; J. E. Warren, Carl B. King Drilling Company, Midland, Texas, 1947; E. C. Brown, Brown Drilling Company, Long Beach, Calif., 1948; J. S. Morris, Allen & Morris, San Antonio, 1949, and W. S. Churchill, Arrow Drilling Company, Dallas, 1950.

A Monument to Cooperation

Present officers of AAODC are, front row, left to right, Earle C. Flesher, Johnson & Flesher, Oklahoma City, vice president for Central Mid-Continent; J. V. Dunbar, Dunbar Drilling Company, Salem, Ill., vice president at large; A. W. Thompson, Thompson-Carr, Inc., Houston, president; Brad Mills, Dallas, executive vice president; Marion S. Church, Dallas, general counsel; Louis A. Beecherl, McDaniel and Beecherl, Dallas, treasurer. Back row, A. H. Bell, Bell & Burden, Inc., Los Angeles, vice president for California; Harry H. Hillman, California Production Service, Long Beach, vice president for well servicing; E. K. Carey, E. K. Carey Drilling Company, Denver, vice president for Rocky Mountains; J. U. Teague, Columbia Drilling Company, Houston, vice president for Gulf Coast; N. H. Wheless, Jr., Wheless Drilling Company, Shreveport, vice president for Cretaceous and Tertiary Basins; Harold M. McClure, Jr., McClure Drilling Company, Alma, Mich., vice president for cable tools; R. S. Makin, Makin Drilling Company, Hobbs, N. M., vice president for West Texas and New Mexico; and J. Doyle Settle, Dallas, secretary. Not present when the picture was made was Thomas S. Doran, Vandalia, Ill., vice president for Illinois, Michigan, Indiana and Kentucky.

A DOZEN men dedicated to the best ideals of American business met in Chicago 12 years ago and formed the American Association of Oilwell Drilling Contractors.

Here was an invitation to friendship, to fellowship, to cooperation, and it met with skepticism in a fiercely competitive industry which rewards only the bold, the ingenious, and the self-reliant.

But they persevered, these 12, and with a few others of sympathetic mind, they trooped from city to city, arguing, cajoling, organizing.

Today the AAODC has a membership of 545 contracting firms and 184 associates. It represents 65 percent of all U. S. drilling firms owning 75 to 80 percent of the rigs.

It has welded stalwart individualists into a unit beneficial to themselves, their industry, the entire oil business and the nation.

Officers elected at that first meeting were J. E. Brantly, Drilling and Exploration Company, Los Angeles, president; Harry L. Edwards, Houston, vice president at large; W. S. Churchill, Arrow Drilling Company, Tulsa, vice president of rotary drilling; J. J. Klise, Wooster, Ohio, vice president of cable tool drilling; and C. J. Paine, Paine Drilling Company, Dallas, secretary-treasurer.

Likewise in attendance were these contractors: W. I. (Bill) Lewis, Mount Vernon, Ill.; Burr Lambert, Centralia, Ill.; Walter Tschudin, Pioneer Drilling Company, Salem, Ill.; John J. Moran, Moran Bros., Inc., Wichita Falls; Arch Rowan, Rowan Drilling Company, Fort Worth, and George Livermore, George P. Livermore, Inc., Odessa, Texas.

At the Chicago meeting the youthful AAODC adopted a prodigious work program which remains as the cornerstone of the organization's lofty tower of achievements.

It was proposed:

- To conduct an educational campaign among the employes of the sustaining members.
- To provide a means of discussion of drilling methods and practices.
- To promote studies to reduce drilling costs and simplify cost accounting.
- To advance accident prevention work.

These early goals have been added to, or amended, by such successful projects as exhaustive studies of equipment and drilling practices; improvement of the status of all industry personnel; study and correction, where needed, of labor and transportation laws; establishment of local, regional and national meetings, and promotion of better understanding between the contractors and their employers.

In detailed terms, the organization's recent and projected activities include this impressive list:

A standard contract drilling form; revision of the Accounting Manual; mud schools; management institutes; standardization of drill collars in cooperation with the API; a survey of expenditures, materials and services

■ CONTINUED ON PAGE 59

Tenure of Triumphs

The AAODC, Under President Thompson, Has Reached Goals Surprising Even to the Most Optimistic

A. W. Thompson

THE American Association of Oilwell Drilling Contractors, now on the eve of completing its second consecutive year of industry-benefiting expansion under the qualified tutelage of twice-elected President A. W. "Tommy" Thompson of Houston, has shown accomplishments that could not have been forecast by even the most optimistic of its members.

The list of contributors to the association's progress is long. But no single supporter of the AAODC has had more to offer than has Thompson through his initiative, ability and energy. Guided by devotion to the association, Thompson has provided it with the leadership requisite to its embarking upon an active and constructive program of hand-in-hand help for industry of the caliber exhibited during his tenure.

And through the effective and decisive cooperation of the membership, Thompson, while still president, has seen the program pay off. That, the association feels, is a tribute to the man who has done so much so efficiently and so quickly.

One of the conspicuous achievements of the association the past year was the adoption of a standard form for drilling contracts, which was checkmated many years by disagreement between various industrial groups.

Another accomplishment has been the greatly-expanded association training and education program. Approximately 1300 men were schooled the past year in AAODC-sponsored mud schools. A short course on handling and running of casing has been given to more than 3000 men since it was made available in February, 1952. Preparations are under way on a movie-illustrated short course on handling and running of drill stem. A short course on financial management has been presented twice in recent months, and now is being readied for offering throughout different districts.

More than 20,000 copies of the "Primer of Oilwell Drilling," a field man's handbook, have been sold since its publication a year ago. Now well beyond the embryonic stage is another signal achievement—the "Primer of Well Servicing," which is well along the way to publication.

Membership, an ever-accurate gauge reflecting the intensity of effort by the president and other officials of the association, has risen to 729, as compared to 591 as of December 31, 1950.

Progress of the association over the critical two years just passed and the blueprints which have been laid during that time for even more accomplishments in the immediate future afford proof aplenty that the talent of President Thompson was made available to the association when it was needed. And the unanimous plaudits of the association and the industry at large can only be partial reward to a man whose infectious good will and readiness to cooperate in all worthy association projects has made him the epitome of the type of leadership the association seeks in building for itself an even greater partnership with the whole of the oil industry.

Monument To

■ CONTINUED FROM PAGE 58

for oil well drilling; classes on methods and equipment for office personnel of drilling companies; a booklet on terminology and equipment; continuous safety work, including literature, a safety clinic, and awards; diligent efforts to assure adequate equipment and materials for drilling the maximum number of wells; participation by members in other organizations such as The API, National Petroleum Council and the Texas Safety Association; and cooperation with other trade associations toward promoting improved public and industry relations.

And, finally, in the words of Brantly, the first president: ". . . the association proposes . . . to help build a firmer foundation on which we, the drilling contractors, may stand and from which we may render more effective service to those who employ us to drill their wells, to ourselves and to the industry and mankind generally. Unless the association can help to bring about these things, there is no justification for its existence and certainly none for its prosperity."

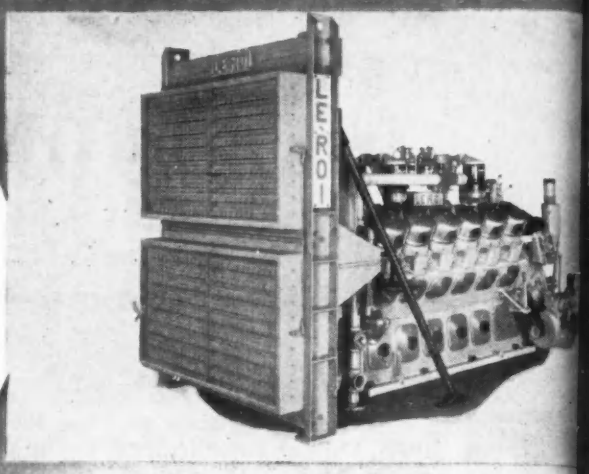
H. D. Paxson

W. J. Alexander

Ed DeWeese

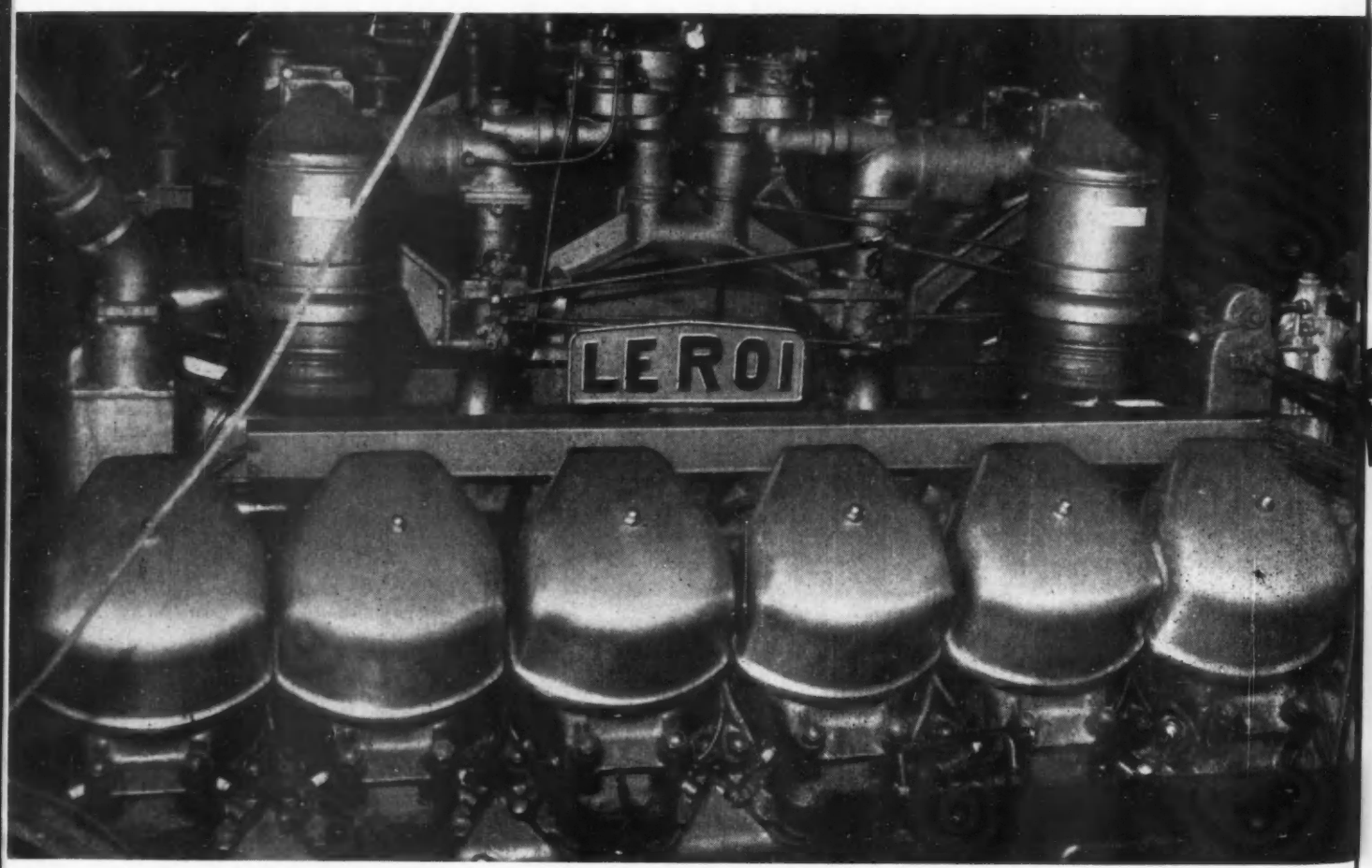
Serving the AAODC at Dallas headquarters are H. D. Paxson, director of membership and public relations; W. J. Alexander, director of field and engineering activities, and Ed DeWeese, editor and advertising manager of The Drilling Contractor.

Le Roi 3-way partnership



1 Better Engines. Men from one of the southwest's largest drilling contractors call Le Roi's L3460 "the finest oil-field engine ever made!" 15 of their 19 rigs are powered by Le Roi L3460 or RX Series engines. That's typical of the oil field's endorsement of Le Roi's progressive design policies.

You come out of the h



Jack Grace Drilling Co. uses 2 Le Roi L3460's to power their rig. In drilling to 9,100 feet, they use 5" drill pipe which makes hoisting load equivalent of 15,000 feet of 4½" pipe.

2 Better Applications. Exclusive Le Roi distributors and factory men are oil-field power specialists. They know engines. That's why they can select the right power unit for any application. That's why you can bank on Le Roi for dependable, low-cost power.

3 Better Service. Ample factory, branch office, and distributor parts stocks mean minimum downtime for repairs. Skilled service men are ready to go 24 hours a day. Keeping your Le Roi engines running is a recognized responsibility.

hole fast!

two Le Roi L3460's hoist 5" pipe from 8300 ft. on wet trip in just two hours!

This recent experience of Jack Grace Drilling Co., Wichita Falls, Texas, is just one demonstration of what the Le Roi L3460's extra power can do. Reports from all fields show that when you need power — fast! — you can count on your Le Roi L3460's.

They are conservatively rated — have plenty of reserve power to pull you out of the tight spots. And they respond to the throttle lightning-fast for hoisting service.

Here you have oil-field power at its best: A wide speed range from 600 to 1350 rpm. Horsepower from 350 to 600 max. Lugging power at slow speeds. Compactness that helps you keep over-all width and weight limitations. Dependability and economy under continuous loads. Like all Le Roi engines, the L3460 operates on the most economical fuels in the oil fields — natural gas and butane.

Ask your rig manufacturer, supply house, or Le Roi distributor to show you L3460 and other Le Roi engine installations — or write us. See for yourself why you're way ahead of the field, when you let Le Roi's 3-way partnership work for you.

LE ROI COMPANY

MILWAUKEE 14, WISCONSIN
Plants: Milwaukee • Cleveland • Greenwich, Ohio
Oil Field Headquarters: Tulsa, Oklahoma

See these Le Roi Distributors for a Profitable 3-way Partnership

Oklahoma
Le Roi Company Branch — Tulsa
Carson Machine & Supply Co.— Oklahoma City

East & South Texas, Gulf Coast
Southern Engine and Pump Company — Houston, Kilgore, Edinburg, Dallas, San Antonio, Corpus Christi, Texas, and Lafayette, Houma, Louisiana.

North & West Texas, New Mexico
General Machine & Supply Co. — Odessa, Snyder, Texas.
Nortex Engine & Equipment Co.—Wichita Falls, Texas.

Kansas
Carson Machine and Supply Co.—Great Bend

Illinois — Western Kentucky
Western Machinery & Engine Company — Centralia, Illinois and St. Louis, Missouri.

Michigan
Hafer Engine Service — Reed City

Rocky Mountain Area
Gehring Equipment Co. — Casper, Wyoming, Rangeley, Col.

Mississippi, Arkansas and Northern Louisiana
Ingersoll Corporation — Shreveport, Louisiana, Jackson, Mississippi, El Dorado, Arkansas

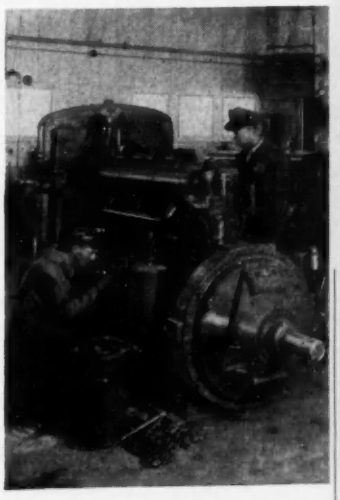
West Coast
Le Roi-Rix Machinery Co. — Los Angeles, Long Beach and Bakersfield, Calif.

Appalachian Area
P. C. McKenzie Co., Pittsburgh, Bradford.

Canada
Lucey Export Ltd. — Calgary, Edmonton, Alberta.

P-114

A Typical Le Roi Service Facility



This service shop, equipped with the finest tools available for engine overhaul, belong to the Gehring Equipment Co., Casper, Wyoming. Gehring provides prompt service to an area stretching from the southern boundary of Colorado to the Canadian border. They maintain the only complete engine parts stock in the Rocky Mountain area. Emergency cases are handled by plane. It is because of service like this that you can always depend on Le Roi.

Pictures Reveal

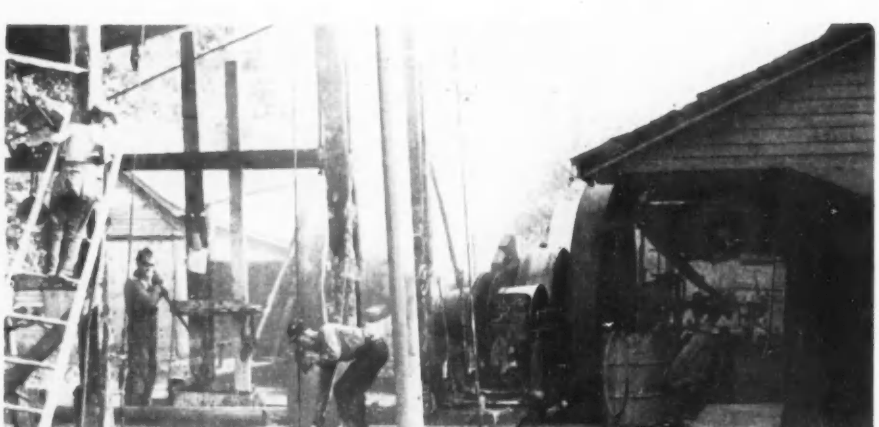
Advance in Drilling Techniques

By REX PARKS

Loffland Brothers Company

Houston

The drilling rig of Drake's stovepipe hat era was wooden—and boarded up.



With the bailer resting on one corner of the derrick floor, the cable tool driller and tool dresser, center of derrick, are ready to make more hole.

FROM the storied yet graceless cable tool rig which pulverized 69 feet of Pennsylvania earth in 1859 to today's sleek giants capable of shoving rotary drill bits to more than 20,000 feet is a stretch of the imagination that turned reality in the toughened crucible of progress' demands.

Colonel Edwin Drake's successful venture almost a century ago was drilled at the rate of 36 inches a day; now wells are being whisked downward to the tune of 2000 feet or more daily. Drake's 30-foot derrick has grown 170 feet or more. The Titusville, Pa., power plant affording a maximum of ten horsepower has increased 200-fold.

These achievements were inevitable results of the inexorable demands placed upon the oil industry by a thirsty market, the forerunner of a national petroleum economy which has helped lead the U. S. to its eminent position. And spiraling requirements were translated to the drilling industry in terms of technological improvements.

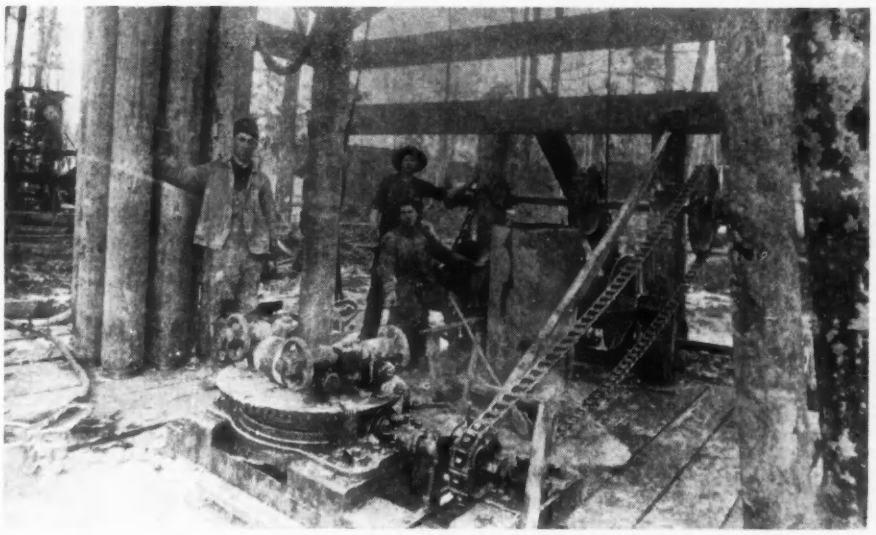
Stages of these advancements bear the familiar traces of succeeding "booms" where they withstood the test of initial use—from Spindletop to

From three feet per day in 1859 to 2000 feet per day in 1952 is the achievement wrought by ever-improving drilling tools and methods.

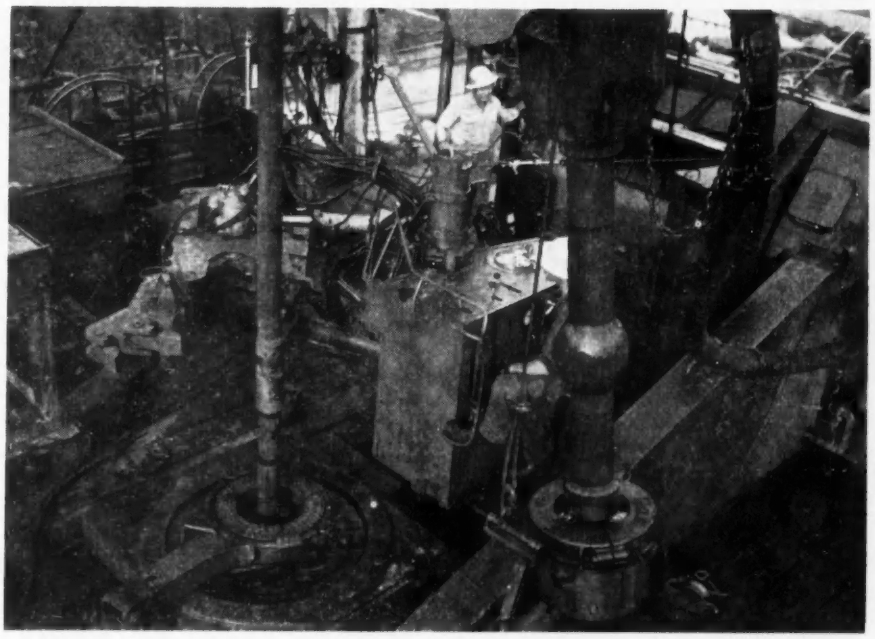
East Texas. Take Signal Hill as one example. It was there that weight indicators, steel derricks, improved coring techniques, special types of drilling bits, and a host of other pieces of drilling equipment and techniques were first put to work.

Indeed, the rotary of today is a far cry from the hydraulic unit developed in the North Dakotas early in the history of this country. The Baker brothers drilled water wells with their crude and simple rig, which was powered by a circle-walking horse similar to the old method of grinding sugar cane for molasses. This type rig was later used at Corsicana, Texas, but the horse was replaced with steam boilers and engines.

From the horse-drawn rig to the boiler-equipped steam rig, the diesel or gas engine rig, which holds the world's depth record of 20,521 feet, is a long step. But keeping stride is the development of such tools as the rock bit, the origin of which is traced back to Spindletop and its pioneers whose vision extended beyond the horizon of their own rigs to explore the potential of an industry which has penetrated remote areas of the world. And to which the world owes its approximately 70 billion barrels of crude already produced.



Early rotary drilling was done without many of today's efficient aids.



Rotary drilling is mechanized now.

Drilling with air is one of the latest innovations, especially where lost circulation is a problem.

Demand Up 4.3 Percent in 1952

Total Demand and Domestic Use to Show Smaller Gains Than Expected, But Exports to Drop Less Than Foreseen

TOTAL demand for all oils in 1952 will be 4.3 percent greater than that in 1951, with domestic consumption up 5.1 percent and exports down 8.3 percent. This is the revised forecast of the U. S. Bureau of Mines for this year, embodied in its *Monthly Petroleum Forecast* covering August.

The revised estimates differ considerably from those in the Bureau's original forecast for 1952, contained in its monthly forecast for last December. The new outlook is for smaller gains in total and domestic demand and less decline in exports than previously expected. The original forecast called for an increase of 5 percent in total demand, an increase of 7 percent in domestic demand, and a decrease of 28 percent in exports.

The figures shown by the bureau for 1951 in the revised forecast are on a new basis to compare with 1952, due to an increased coverage in the stocks of the four major products. The changes in demand that resulted did not alter materially either the total demand or the seasonal trends.

The forecast of exports has been increased, since there is no immediate prospect of the reopening of the Iran refinery, the bureau said. The forecast of domestic demand in continental U. S. has been reduced, since the actual gain in the first quarter, compared with 1951, was only 3.4 percent and the estimated gain in the second quarter was only about 2.0 percent, making an indicated increase of only about 2.8 percent in the first half of the year. The forecast of domestic demand for the second half of 1952 shows a gain of about 7 percent, compared with the relatively low demand in the last half of 1951.

The forecast of domestic demand for 1952 includes estimates of an increase of 10.0 percent for distillate fuel oil, a gain of 5.0 percent for kerosine, and an increase of 2.9 percent in the demand for all other products.

Total stocks of all oils increased 37 million barrels in 1951, and the gain in 1952 is estimated at 5 million. If there should be a greater liquidation of crude stocks than estimated, there would be a corresponding decline in estimated crude production. Considering the increase of about 29 million barrels in product stocks in 1951 and the loss of refinery output in May of this year, a moderate reduction of product stocks is indicated in 1952, particularly in stocks of finished gasoline.

The estimated new supply of all oils required in 1952 is about 3 percent greater than in 1951, and includes a gain of about 13 percent in total imports, an increase in light oils recovered from natural gas of about 8 percent, and a gain of only about 1 percent in required domestic crude oil production. The estimated increase in crude oil refined is 2.2 percent larger than in 1951.

Revised Forecast 1952: U. S. Supply and Demand, All Oils
Source: U. S. Bureau of Mines

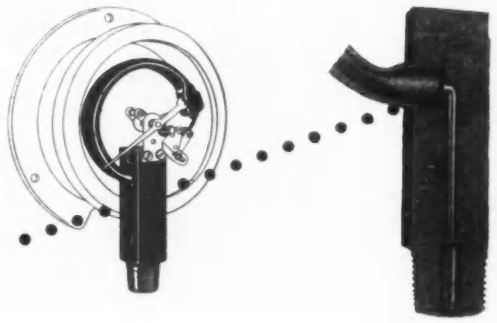
(Millions of Barrels)

ITEM	Actual First Quarter	Estimated Second Quarter	Forecast Third Quarter	Forecast Fourth Quarter	Forecast 1952 Year	Actual† 1951 Year
Production	**631.2**	**590.1**	**633.1**	**648.6**	**2,503.0**	**2,450.3**
Crude	575.4	536.9	577.1	590.6	2,280.0	2,244.6
Other Oils	55.8	53.2	56.0	58.0	223.0	205.7
Imports	**86.1**	**83.9**	**86.0**	**92.0**	**348.0**	**307.7**
Crude	45.2	49.8	54.0	55.0	204.0	179.1
Refined	40.9	34.1	32.0	37.0	144.0	128.6
New Supply	**717.3**	**674.0**	**719.1**	**740.6**	**2,851.0**	**2,758.0**
Change Stocks*	**—20.1**	**18.4**	**37.1**	**—30.4**	**5.0**	**37.0**
Crude	3.3	27.9	—12.4	—2.8	16.0	7.3
Products	—23.4	—9.5	49.5	—27.6	—11.0	29.7
Total Demand	**737.4**	**655.6**	**682.0**	**771.0**	**2,846.0**	**2,721.0**
Motor Fuel	264.2	305.8	322.0	300.0	1,192.0	1,128.3
Residual	163.5	132.5	131.0	165.0	592.0	592.9
Distillate	172.2	97.8	93.0	155.0	518.0	470.0
Kerosine	46.0	22.0	23.0	46.5	137.5	130.1
All Other	91.5	97.5	113.0	104.5	406.5	399.7
Exports	**36.8**	**40.2**	**35.0**	**30.0**	**142.0**	**154.4**
Crude	7.5	6.5	4.5	4.5	23.0	28.6
Refined	29.3	33.7	30.5	25.5	119.0	125.8
Domestic Demand	**700.6**	**615.4**	**647.0**	**741.0**	**2,704.0**	**2,566.6**
Motor Fuel	256.0	298.0	313.0	294.0	1,161.0	1,088.0
Residual	156.7	124.3	125.0	159.0	565.0	563.9
Distillate	166.8	89.5	86.7	150.0	493.0	447.3
Kerosine	44.1	19.9	21.0	45.0	130.0	123.3
All Other	77.0	83.7	101.3	93.0	355.0	344.1
Daily Averages (Thousands of Barrels)						
Total Production	6,937	6,485	6,882	7,050	6,839	6,713
Imports	946	922	935	1,000	951	843
Change in Stocks*	—220	202	404	—330	14	101
Total Demand	8,103	7,205	7,413	8,380	7,776	7,455
Exports	404	442	380	326	388	423
Domestic Demand	7,699	6,763	7,033	8,054	7,388	7,032
Runs to Stills	6,670	5,918	6,900	6,950	6,634	6,494
Demand Domestic Crude	6,302	5,606	6,409	6,439	6,190	6,121

* Plain figures indicate stock increases.
† New basis to compare with 1952.

MARSH *Introduces*—

the most significant pressure gauge development since the "Recalibrator"



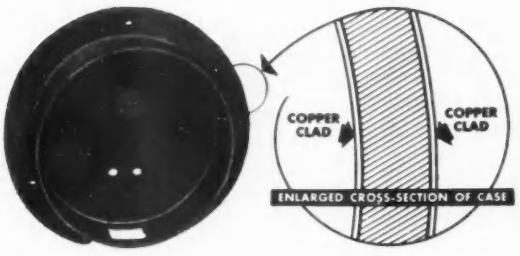
Socket, tube, and end-piece fused into one-piece unit —The problem in every pressure gauge has always been to make permanently leak-tight joints from the inlet to the tip of the bourdon tube.

Marsh construction has always provided the utmost in leak-tight assemblies. But just as welded piping is always more sound than the best joined piping, the fusing of the assembly into an integral unit reduces the possibility of leakage to the vanishing point.

It required extensive research to develop a method of welding the parts into a one-piece unit, but a special process has now been perfected. The result is known as

the "Canoweld" Tube

After fusing, the tube is accurately tempered to required resiliency. The unretouched photo of a socket sawed in half shows the perfect fusion of the joint most difficult to make — the joint where the tube enters the socket. Photomicrographs are available to prove the perfection of the process.



Four times as strong and one-third lighter than a cast iron case — This copper-clad, wrought steel case of boiler plate thickness has the advantages of any type of case — without the faults. It is known as

the "Marshalloy" Case

This case is four times as strong and one-third lighter than conventional cast iron cases. The copper surface makes it as non-corrosive as a plastic or die-cast case. It is finished in a newly developed corrosion-resistant satin black enamel that makes it as attractive as it is durable. Fitted with Marsh safety blow-out plug, it sets a new standard in gauge housing.

THE Marsh developments presented here unquestionably represent the two greatest contributions to pressure gauge accuracy and stamina in recent years . . . the most important advancements since the introduction of the Marsh "Recalibrator."

These improvements take on all the more significance from the fact that they are contributed to the line of gauges that has become the symbol of gauge accuracy and permanence . . . the Marsh "Mastergauge" line.

Foremost and most basic of these improvements is the fusing of the socket, tube, and end-piece into the equivalent of *one-piece* construction. Marsh Methods have always achieved the utmost in leak-tight construction, but here is something still better: the joints are *eliminated!*

Second only to the one-piece socket, tube, and end-piece is that new "Marshalloy" copper-clad case. It is a case that retains all advantages of all kinds of cases; eliminates all the faults.

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PAD Boss Says Drilling to Regain Pre-Strike Levels Early in 1953

An interview with

J. ED WARREN

Deputy Administrator

Petroleum Administration for Defense

Editor's Note: *J. Ed Warren, 23 years an oilman and now Deputy Administrator of Petroleum Administration for Defense, takes a look at the steel supply situation and answers some criticism of PAD personnel. In this interview he passes along some information to producers, contractors and manufacturers that might help them get the steel they need.*

J. Ed Warren

Q. *How long after termination of the steel strike is the shortage of tubular goods likely to hold drilling operations below pre-strike levels?*

A. Because of the steel strike and the resulting loss in production of oil-country tubular goods, drilling operations are not expected to reach pre-strike levels until early 1953.

Tubular goods were being delivered to the end users within two weeks after the strike was settled. This, though, was material that had been scheduled for delivery in the second quarter of 1952 or earlier. This production together with third-quarter scheduled production and a limited amount of conversion-steel production available in the fourth quarter will have to maintain drilling for the rest of the year.

There will be no quarterly allotment of regular-production tubular goods for the fourth quarter.

A small tonnage of regular-production pipe produced in mills not affected by the strike will be available, but this will be distributed to applicants for conversion pipe.

Q. *Aside from tubular goods, what oil-industry materials are likely to be in most critical short supply in the near future?*

A. All component parts made from alloy steel, plates, and heavy structurals.

Q. *Prior to its interruption by the steel strike, was the tubular goods stockpile idea for wildcat drilling working out as well as PAD hoped?*

A. Yes. Wildcatting has actually increased since PAD has been in existence. The increase is due in large part to the wildcatting by operators who drill 40 or fewer wells in a year and who have access to this special reserve of tubular goods. Historically, the smaller operators have been responsible for the major part of exploratory drilling in the United States. Without the stockpile system these operators could not continue wildcatting at present rates, and the exploratory program so vital to the increase of our petroleum reserves would suffer.

Q. *Had these stockpiles taken care of most wildcat needs?*

A. Unfortunately the amount of material directed into wildcat stocks —5 percent of the total tonnage allocated to the industry each quarter— has not been quite large enough to fill all the wildcat needs of the smaller operators. We in PAD feel the lack is explained in part at least by the misuse of the stocks by some operators.

Q. *What about an emergency stockpile of drill pipe similar to that of wildcat casing where contractors could obtain replacement of lost strings to prevent rig shutdowns?*

A. There already is an effective emergency stockpile of drill pipe. Each quarter about 5 percent of the total drill pipe allocated to the industry is ordered to M-6 stocks and is distributed:

- When the contractor does not have on hand or timely available sufficient drill pipe to reach the contracted depth of a well in the process of drilling, provided this depth is in keeping with the depth range of the drilling equipment.
- When, in the course of drilling, the contractor's drill pipe is lost or damaged and cannot be readily replaced by other drill pipe owned or controlled by the operator or timely available to him.

Q. *What percentage of PAD's quarterly requests for steel usually have been granted?*

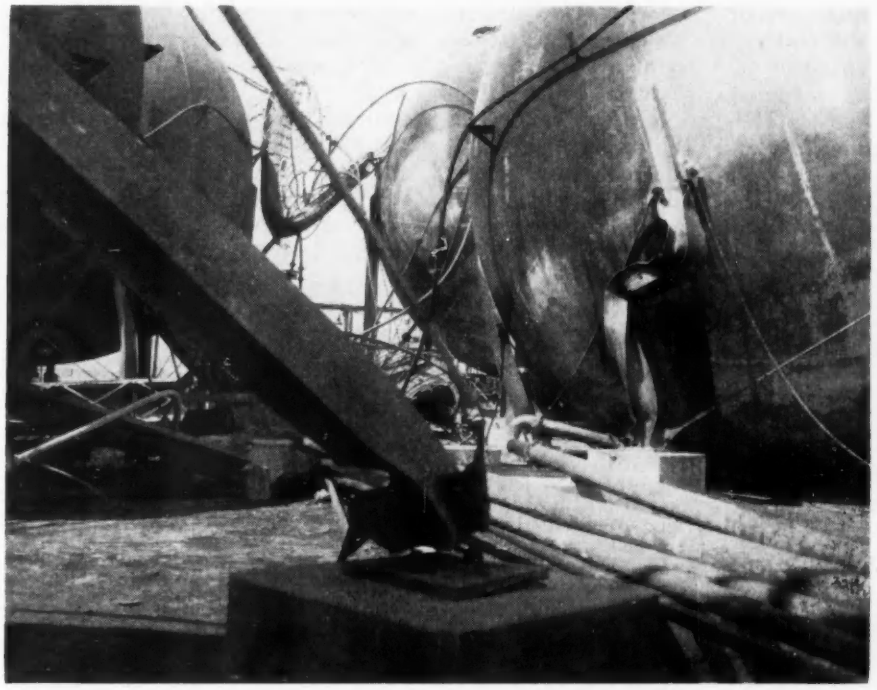
A. PAD has received from the Defense Production Administration the following percentages of its requests:

	Domestic	Foreign
1st Quarter 1952...	78%	77%
2nd Quarter 1952..	81%	89%
3rd Quarter 1952..	83%	82%

Q. *What percentage of tubular goods goes to the larger companies?*

A. Over the past five quarters PAD has allotted to some 150 operators who normally drill more than 40 wells a year an average of 58 percent of the total tonnage. In 1951 this group

■ CONTINUED ON PAGE 68



Graphic evidence of terrific force of California earthquake is seen in this close-up view of spherical storage tanks which were toppled at Paloma cycling plant. Jolting, east-to-west horizontal earth movement buckled and twisted heavy supporting columns, causing tanks to fall to ground.

Quake Hazards Shown in California

Recent Experience Demonstrates Damage That Can Be Expected On West Coast From Earth Tremors

By GILBERT M. WILSON
WORLD OIL Staff

DAMAGE to oil installations and operations, caused by the jarring earthquake which struck Southern California in the early morning hours of July 21, and in subsequent after shocks since then, by now has been fairly well assessed and evaluated. Generally speaking, when compared to the destruction wrought to buildings, homes, railroads, power lines and agricultural installations in the area, the oil industry escaped with relatively light damage.

Hardest hit by the earthquake was the large cycling plant in the Paloma field, some 17 miles southwest of Bakersfield, where upwards of from 1 to 1.5 millions of dollars of damage was done either as a result of the quake or the subsequent explosions and fire which ripped through the plant immediately after the first shock hit. It is estimated that it will be a matter of months before the plant will be able to resume full operation again.

Principal damage in the plant, due to earthquake, explosions and fire, was done to cooling towers, compressor building, jacket water cooling tower and pump house, storage tanks, metering equipment, LPG storage tanks and, of course, hundreds of valves, instruments and much piping related to those installations. Storage tanks holding LPG and other highly volatile fluids suffered severe damage, being either knocked to the ground, shifted on their concrete base, or having underpinning weakened. It is believed that much of the highly explosive vapor released from broken lines, tanks and valves, and ignited by a broken power line, touched off the violent explosion that followed the initial earth shock by perhaps one and a half minutes.

In addition to the many windows, roof sections, walls and instrument control shelters within the plant that were crumpled, blown out or otherwise damaged, a number of lines were broken and unions valves or regulators were damaged sufficiently to allow gas to escape. As a consequence, localized jets or sprays of flame added to the damage done to the larger installations.

Fortunately, none of the plant employes on duty at the time was seriously injured and they were able to reach and actuate emergency valves to shut down compressors, boilers and other key segments of the plant. Compressors were not shifted from their bases, but some installations, including high-pressure vessels mounted on concrete bases, were shifted, shearing or stretching anchor bolts.

One plant employe, who was just leaving his control station in the plant to take routine 5 AM readings (earth-

quake occurred at 4:52 AM) likened the earthquake to 100 freight trains roaring by. Accompanying the roaring sound was the first of the violent shocks. His first thought being that the area had been atom bombed, he dashed toward the rear of the plant, where he knew he could find shelter from possible flash burns under the large LPG storage tanks located there. As he sprinted in that direction, he saw some of them crumple and fall to the ground. Swiftly altering his course, he raced toward an open area north of the plant and, fortunately, was safely out of the flash area when the first explosion hit the plant.

Shortly after the earthquake, the 90-odd high-pressure wells in the field were shut in.

Elsewhere in the San Joaquin valley, effects of the earthquake were varied. In the Fruitvale field, several miles west of Bakersfield, as well as in certain other fields in the vicinity, some operators reported a rapid build-up of gas pressures in certain wells. Production fell off rather sharply in some wells, and in others a slight increase was noted. The build-up and increase in volume of gas in these old and settled fields probably were caused, it is believed, by the "shaking up" of the producing formation, causing a breaking-out of gas in much the same manner that carbonated gas can be shaken out of a bottle of soft drink beverage.

Wells Sand Up

In some instances, sanding-up of some producing wells was credited to the quake. In the Maricopa area, some 10 to 15 miles southwest of the Paloma field, effects of the quake were less noticeable, although in at least one instance, one or two producing wells suddenly went to water. Although it is difficult to definitely ascribe this to the earthquake, it is believed probable that the tremor caused the failure of a water shut-off in one or both of the wells. In some localities in the Bakersfield area, a few oil sumps were slopped over and, to a limited extent, gathering lines, water lines and some storage tanks were damaged. After the quake, oil tanks in the vicinity of the hardest-hit portions of the valley were found to have either spilled over or showed evidence of a high "wave" being set up inside with crests occurring on the east and west sides of the tank. A few tanks were known to have been partially buckled, and some were shifted slightly on their gravel bases. Some water wells in the Arvin area, closer to the epicenter of the earthquake, were knocked out and, strangely enough, some that previously had been poor producers now showed as good wells. Many water wells were muddied up for several days after the temblor. Power installations in many fields were knocked out as a result of transformer banks being dumped to the ground and shorting occurring in power equipment.

Pipe Lines Broken

Two companies suffered losses due to breaks in their crude oil trunk lines, both of them 10-inch size, in the Ridge Route area between Bakersfield and Los Angeles. On one of them, some 10,000 barrels of crude oil were sent streaming down the canyon, but quick action by crews in cutting off the flow and damming up creek beds, prevented further losses. A land slide, in at least one of the occurrences, broke a joint or two of the pipe line.

Drilling operations were little affected by the temblor, although some contractors operating in the heaviest-hit areas reported their rigs received a severe shaking-up. In a few instances, with fresh water from nearby wells knocked out, vacuum trucks were pressed into service quickly to supply rigs with fresh water.

In at least one instance, a re-drill job or workover was required as a result of what is suspected to be underground damage caused by the earthquake. A well in the Mountain View-Arvin area, some 4500 feet deep, had been drilled and put on production only a few weeks earlier, and at the time the quake hit, dropped down in production. A rig was moved in, and an attempt was made to pull the liner, which was found to be collapsed. It could not be pulled and had to be cut up in pieces and removed. Examination of the liner indicated it had been badly bent and crushed in several places. After cleaning the hole to the bottom and running a new liner, the well again was placed on production. Current output of the well is about what it had been before the damage occurred.

There were numerous instances of earth cracks cutting across roads and the displacing of cotton rows by earth movements, minor scarps and crevasses that occurred in the Arvin vicinity.

PAD Boss

• CONTINUED FROM PAGE 66

of operators drilled 60 percent of the total footage drilled by the industry.

Q. *What portion of tubular goods allocated to foreign operators has been delivered for 1952?*

A. During the first and second quarters approximately 85 percent. No later figures are available, of course.

Q. *Aside from tubular goods, what basis is used to equivocally allocate steel to manufacturers of other types of oilfield equipment, such as pumping units, crown blocks, rotary tables, drawworks, derricks, etc.?*

A. Basically the standards are those set in instructions formulated by the Control Operations Division of the Program Coordination Bureau, NPA, which issues instructions to all industry divisions which process CMP-4B applications. Of course, we make some minor deviations from the base in line with the demand for the various components.

Q. *A complaint has been made that PAD's personnel is composed of too many big-company members. Among your present department heads and assistants, how does the number coming from major companies compare with those from smaller companies?*

A. PAD has a total staff at the moment of 320 persons, 157 on the executive and technical staff, 163 on the clerical and stenographic staff. Of the 157 on the executive and technical staff, 107 come from the oil industry or related industry—53 from large oil companies and 54 from small companies, independent enterprises, and supply and service companies.

Q. *Have you any suggestions to offer producers, contractors, or manufacturers which might help them get the steel they need?*

A. There are four suggestions that may be helpful:

- Establish as close as possible a relationship with suppliers.
- Plan on your known requirements as far ahead as possible and let PAD know what those requirements are.
- Wherever possible, substitute a material in ample supply for one in short supply rather than insist on having exactly what you would prefer.
- If you find yourself unable to get delivery on an order, as soon as possible—certainly before expiration of the lead time—notify the National Production Authority on Form NPAF-148, which is a data sheet for requests for assistance in placing authorized controlled materials orders. Copies of this form may be obtained from any NPA field office.

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Board Tackles Mississippi's Problems

Oil and Gas Companies Cooperate With Conservation Agency; Group Joins Other States in Fight Against Federal Control

By H. M. MORSE
Secretary and Supervisor
State Oil and Gas Board, Jackson, Miss.

IN AN oil and gas area with such varied characteristics as those in Mississippi, companies and individual operators face many operational problems. However, since this summary is not concerned with technology, it will be confined to a discussion of some of the issues of interest to the State Oil and Gas Board of Mississippi and the men who are developing the state's oil and gas resources.

Perhaps the most pressing problem facing the operator in Mississippi today—and this problem is general to the industry—is the threat of federal control. Studies by the State Oil and Gas Board have revealed a dangerous trend toward governmental usurpation of the functions reserved by legislative enactment to the board. Fortunately, the entire industry in Mississippi is solidly behind the fight which has been carried on and will continue to be waged by the regulatory body in Mississippi to manage its own house.

Another important problem facing the industry and the board is the integration of leasehold interest and royalty interest in oil and gas units. The board has held that it has the power to integrate oil into oil units and gas into gas unit. It does not think, however, that it has the right to try title interest within these units.

Salt water disposal is a problem where the salt water is stored in open pits for evaporation. Salt water in these pits tends to contaminate surface waters. Mississippi operators now are required to conform to prescribed methods of drilling and completing salt water disposal wells into salt water sands, either above or below the producing horizon,

Mississippi operators are becoming secondary-recovery conscious. The board feels that this operation will play an important role in the future development of the state's resources. As an industry aid in planning secondary recovery operations, the board issues a monthly bulletin showing production by individual wells as to oil, gas, and salt water, and a cumulative production for that year by individual wells. At year's end a bulletin is published showing the cumulative production by wells and sand. These reports inform the industry as to the total voidage of the reservoir and, it is believed, will aid in obtaining a much larger amount of oil. This information is published on each individual pool and reservoir, so that these studies can be continuous and contribute to the prevention of waste both underground and aboveground.

Some operators who are newcomers to the state may consider Mississippi's statewide rules affecting the formation of drilling units as a problem. It may be in order to give a brief explanation of these rules.

The formation of drilling units as set out in the statewide rule is rather rigid in that the diagonal of the two points farthest apart shall not be greater than 2100 feet. This applies in areas where the boundaries of property are described by metes and bounds rather than by governmental quarter quarter sections. Actually this rule assists the oil operator in decreasing the number of unnecessary wells and better protects the co-equal and correlative rights of leasehold and property interests. This rule also prevents island acreage in producing areas.

Allowables are set by the board on the maximum efficient rate of production. This is done after notice and hearing. Board engineers go into the field, make a study of well behavior under varying conditions, and make their reports.

Because of extremely high pressures in some areas, operators have many and varied casing problems. Every effort has been, and will continue to be made by the State Oil and Gas Board to work harmoniously with operators and their engineers in solving these important problems.

A problem confronting the board and which is causing much concern is the matter of production of oil into storage tanks. This is especially true where more than one reservoir is under consideration. It is felt that when a maximum efficient rate is established on a well, this well should produce the amount of oil set out in the allowable and not overproduce in the amount of oil that another well is deficient. This condition is as vital to the interests of the individual operator as it is to the state and is a problem which can be solved only by the operator's complete cooperation. It is felt that where one well exceeds its allowable, underground waste is taking place by increasing the flow of salt water into the reservoir, or by unnecessary dissipation of reservoir energy.

Mississippi is interested in the development of its oil and gas resources, but wants such development to follow an orderly pattern, in keeping with the best concept of conservation. The State Oil and Gas Board was created by the state legislature pursuant to Chapter 256 of the Laws of 1948, and became effective May 12, 1948. The members named at that time had little knowledge of the oil business. To many oil and gas operators this lack of knowledge posed a serious problem, but, fortunately, the members, during the past four years, have benefited from evidence in many and varied cases.

The State Oil and Gas Board lays no claim to having the best conservation law or that they are the best conservationists in the country. It has a job to do and is endeavoring to do that job to the best of its ability and judgment. Board members feel that the industry's problems are their problems. They are prepared to cooperate in solving them.

NEW AND IMPROVED EQUIPMENT

SUPPLEMENTING COMPOSITE CATALOG

KEEP INFORMED by requesting additional information on new epuipment and services described on this and following pages. SAVE TIME by using one of the free and convenient Reader Service Postcards on opposite page. Circle number on card corresponding to the number listed at the end of each new equipment item on which you desire additional information.

Fire Shield

This item supplements Gustin-Bacon Manufacturing Company data on pages 2102-2103 of Composite Catalog, 18th Edition.

A lightweight fire shield, made of glass fiber insulation by Gustin-Bacon Manufacturing Company, enables firefighters to approach within a few feet of a fire with effective protection against radiant heat. Weighing only 26 pounds, the shield stops heat by means of a blanket of Ultralite glass fiber insulation fitted to a framework of tubing.

Circle No. 14 on Postcard

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Safety Equipment Cleaner

This item supplements Mine Safety Appliances Company data on pages 3366-3367 of Composite Catalog, 18th Edition.

Personal safety equipment—face-shields, respirators, mask facepieces, ear defenders and clothing—can be cleaned and sanitized thoroughly in a solution of MSA Cleaner-Sanitizer, a new product of Mine Safety Appliances Company. The material is in dry powder form, packed in individual envelopes. The user adds an ounce of the powder to a gallon of luke warm water, cleans and rinses equipment, then allows it to air dry. Bacterial count is said to be reduced to levels judged safe by public health standards.

Circle No. 15 on Postcard

Acid-Proof Hose

This item supplements Hewitt-Robins Incorporated data on page 2250 of Composite Catalog, 18th Edition.

A new rubber hose developed by Hewitt Rubber division of Hewitt-Robins Incorporated is said to resist concentrated organic and inorganic acids. The manufacturer believes the material to be 100 percent resistant to acetic, hydrochloric and hydrofluoric acids, 75 percent to nitric acid, and 98 percent to sulfuric. It will withstand the action of fuming nitrate over 86 percent if used for intermittent service.

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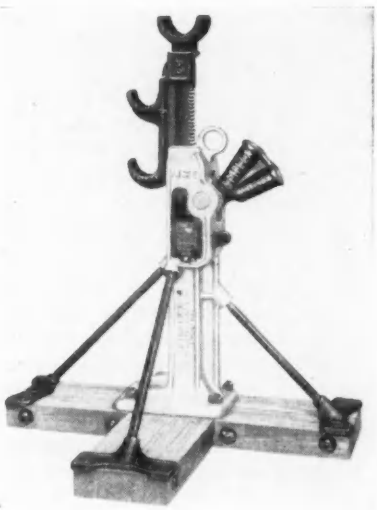

Reel Jack

This item supplements Templeton, Kenly and Company data on pages 4812-4813 of Composite Catalog, 18th Edition.

The Simplex A1029, a new lightweight reel jack made by Templeton, Kenly and Company, has an aluminum housing. The single-acting jack has a rugged, laminated oak T-base and other characteristics of the Simplex Ratchet Lowering Jacks. Capacity of the new jack is 10 tons; closed height is 29 inches; lift is 13¾ inches; and weight 83 pounds.

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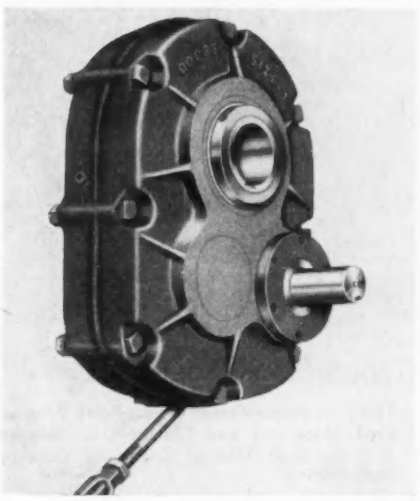

Speed Reducer

This item supplements Dodge Manufacturing Corporation data on pages 1431-1434 of Composite Catalog, 18th Edition.

A new double reduction, shaft-mounted speed reducer with capacity to 43 horsepower and for output speeds from 12 to 110 revolutions per minute, has been introduced by Dodge Manufacturing Corporation. The new No. 7 reducer has 59 percent greater horsepower than the Dodge No. 6 model. Like earlier models the No. 7 is shaft-mounted and anchored with a torque-arm which fastens to any fixed object. Belt tension is adjusted by means of a turnbuckle.

Circle No. 18 on Postcard

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Spiral-Wound Gasket

This item supplements Flexitallic Gasket Company data on page 1696 of Composite Catalog, 18th Edition.

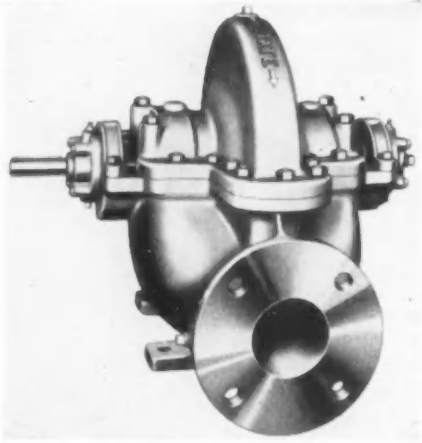
Teflon is now being used in spiral-wound gaskets for applications where extreme inertness to chemicals is important, Flexitallic Gasket Company announced. The gasket is constructed of alternating plies of Teflon and stainless steel, a method which is said to eliminate cold-flow normally encountered in a Teflon seal. Trapped between edges of metal, the Teflon cannot flow.

Circle No. 19 on Postcard

NEW EQUIPMENT

SUPPLEMENTING COMPOSITE CATALOG

To obtain additional information use convenient Reader Service Postcard on page 73. Circle number on card corresponding to number listed at the end of each new equipment item on which more information is wanted.



General Service Pump

This item supplements Peerless Pump Division, Food Machinery and Chemical Corporation data on page 4165 of Composite Catalog, 18th Edition.

A new line of horizontal, split-case, general service pumps introduced by Peerless Pump Division uses standard mechanical shaft seals, instead of conventional stuffing boxes. This is said to obtain savings in floor space, shorter shaft lengths, and easier pump servicing. Peerless Type AS pumps are available in discharge sizes from 1½ through 4 inches. Capacity range is up to 750 gallons per minute and head range is up to 230 feet. General application is for pumping water and clear liquids up to 200° F. where no solids are in suspension.

Circle No. 20 on Postcard

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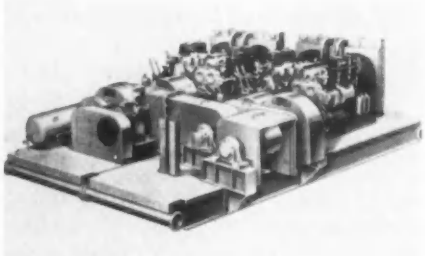

Consolidated Rig

This item supplements The National Supply Company data on pages 3501-3632 of Composite Catalog, 18th Edition.

A new consolidated rig of sectionalized construction, for use with two torque converter equipped engines having a combined output rating of 550 horsepower, has been introduced by The National Supply Company. The Ideal Type 55 will normally be used for drilling in the 5000 to 7500-foot depth range. Sectionalized construction permits use of a large spooling drum, 22 inches in diameter and 49 inches long, grooved for use with 1⅛-inch wire line. This drum capacity allows usual hoisting operations with less than three full layers of line on the drum. Drawworks and drive group are transported in completely assembled packages.

Circle No. 21 on Postcard

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Piston Rod Combination

This item supplements Keystone Tool Corporation data on page 2664 of Composite Catalog, 18th Edition.

Keystone Tool Corporation now manufactures a piston rod-pony rod combination with tool joint connections. Furnished for any make power slush pump, the combination rod utilizes tool joint threads for connecting the piston rod to the pony rod. With a tool joint pin on the piston rod, and a tool joint box in the pony rod, it can be removed with only a slight wrench movement. To safeguard against loosening, a wing lock nut is provided on a straight thread section of the pin end. The tool joint threads eliminate danger of cross-threading when the rod is replaced.

Circle No. 22 on Postcard

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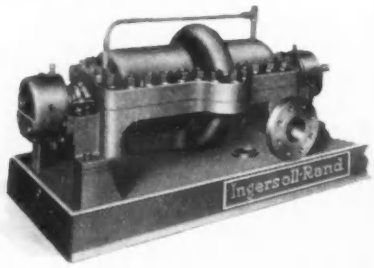
Centrifugal Pump

This item supplements Ingersoll-Rand Company data on pages 2485-2492 of Composite Catalog, 18th Edition.

Ingersoll-Rand Company has redesigned its line of horizontal, multistage centrifugal pumps, Class CNTA, for medium-pressure applications to 800 pounds. Built in 1½-, 2-, 2½- and 3-inch sizes, units are



available with 4, 6 or 8 stages. The pump has a horizontally-split, smooth-bore cylindrical casing which contains the Unit-Type rotor assembly. The rotor assembly can be quickly removed from or installed in the casing, since there are no mating ring fits or delicate alignment problems. Multiple-volute design of the rotor eliminates radial thrust at all conditions of operation. Back-to-back grouping of the impellers neutralizes axial thrust developed by the pressure differential across each stage.

Circle No. 23 on Postcard

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Nipple Chuck

This item supplements Beaver Pipe Tools, Inc., data on pages 620-621 of Composite Catalog, 18th Edition.

A Universal Nipple Chuck, Model 55, capable of threading ⅛- to 2-inch pipe, has been introduced by Beaver Pipe Tools, Inc. The machine has

only three parts: a polished steel body, sliding plunger and hardened steel threaded shank. The nipple chuck can be used with a pipe machine, power drive, any pipe vise or a machinist's vise.

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OTHER NEW AND IMPROVED EQUIPMENT

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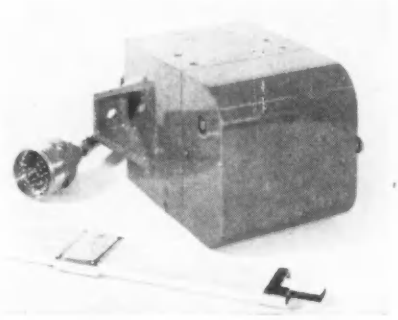
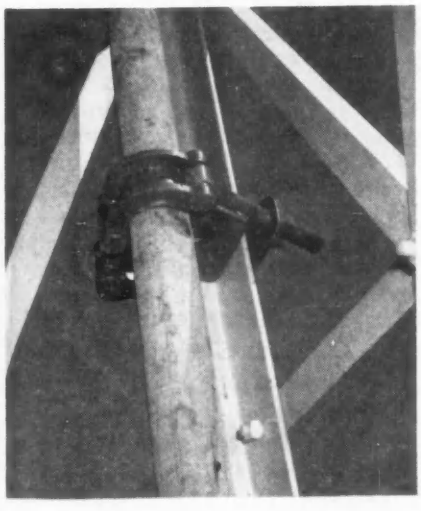


Oscillograph

The new Model 560 oscillograph made by Midwestern Geophysical Laboratories is said to record under extreme shock and acceleration conditions. The instrument is capable of making 12 simultaneous records, although the width is only 4⅞ inches. Height is five inches, and length seven inches. The machine has a 12-channel magnetic assembly with facilities for mounting damping resistors for each channel inside oscillograph.

Circle No. 25 on Postcard



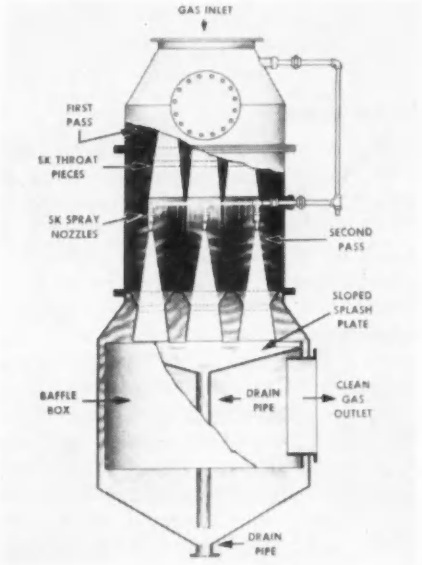
Standpipe Anchor Clamp

The S & S Specialties one-bolt Standpipe Anchor Clamp fits four-inch standpipe, and will fit any make of standard derrick regardless of height. Said to eliminate all rattles and vibration, the clamp is a carefully machined electric steel casting.

Circle No. 26 on Postcard

Gas Scrubber

Schutte and Koerting Company's "Packaged" Gas Scrubber Unit will handle gas containing wettable solids and condensable gases, as well as gases and solids which can be cleaned by obtaining a chemical reaction between the gas or solids and selected



spray liquid. In the case of gases containing non-wettable solids or dust, a suitable wetting agent can be introduced into the spray liquid. The unit consists of scrubber box, spray nozzles, and throat pieces. The scrubber box is divided into compartments, so that as many may be added as necessary.

Circle No. 27 on Postcard

Map Cabinet

The Seven Star Space Saver map cabinet made by Port City Cabinet Works consists of a series of 2 x 2-inch square horizontal compartments. Each compartment is labeled and slides out so that the map is easy to reach. Exterior of the cabinet is ¾-inch, five-ply hardwood, with mitered lock joints. Sliding doors are banded on the edges with hardwood and individually locked and keyed. Cabinet finishes are available in walnut, oak, mahogany, olive drab, grey, natural or blond.

Circle No. 28 on Postcard

Liquid Meter

The Weigh-O-Matic liquid meter made by Oil Metering and Processing Equipment Corporation, Houston, provides a simple means of measuring liquids. The meter weighs liquids continuously in small batches and totals the number of these batches on a mechanical counter. By knowing the given weight held by each compartment of the meter, which in turn represents a given volume of liquid, the volume of liquid passing through the meter can be easily determined. The OMECO meter consists of a bucket divided into two equal compartments, and mounted on a shaft and two self-aligning lubricated ball bearings. The meter is available in ⅛, ¼, ½ and 1 barrel per dump sizes in three models.

Circle No. 29 on Postcard

Paint Strainer

The new Rein paint strainer offered by Gardner Laboratory, Inc., Inc., has an aluminum-coated steel wire stand. The stand supports an aluminum funnel in which a copper mesh strainer is held in place by a steel wire loop. The strainer can be used in laboratory or shop to strain finishing materials.

Circle No. 30 on Postcard

To obtain additional information use convenient Reader Service Postcard on page 73. Circle number on card corresponding to number listed at the end of each new equipment item on which more information is wanted.

Protective Coating

Neelium, a new high-solids liquid Neoprene solution offered by Atlas Mineral Products Company, can be brushed and cured at ordinary temperatures to form a thick resilient protective film. Neelium is resistant to acids, alkalis, oils, aliphatic hydrocarbons, sunlight and weathering, and has a solids content of greater than 60 percent.

Circle No. 31 on Postcard

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Oscillator

A new low frequency oscillator, for use as a source of signal power in the range of .01 to 100 centipoises, has been announced by Southwestern Industrial Electronics Company. Model "L" uses passive elements (resistors and condensors) for frequency determination. The circuit has been treated as a DC amplifier. Output circuit is directly coupled to the load and will produce 20 volts or 20 milliamperes into any load impedance. This instrument is a true sine wave generator, and the wave shape contains only low order harmonic distortion. Two separate means for amplitude control are provided.

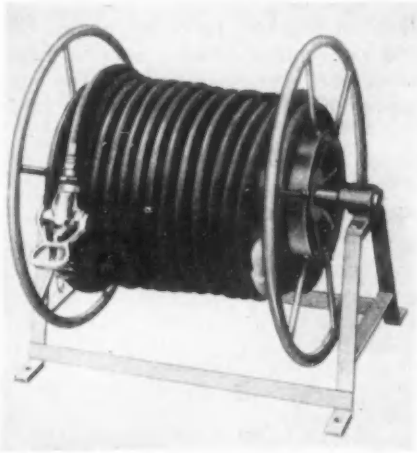
Circle No. 32 on Postcard

•

Expansion Joints

A three-inch size has been added to the general line of Flexon expansion joints made by Flexonics Corporation. The joints in both controlled- and free-flexing types offer pipe line motion control with comparatively small over-all expansion joint dimension required to handle a given amount of pipe line expansion.

Circle No. 33 on Postcard



Hose Reel

Water pressure available at the hose nozzle even when the hose is coiled on the reel, is the claim made for a new continuous flow hose reel made by Wirt & Knox Manufacturing Company. A swivel joint connection in the pipe line permits application of a full stream of water on the fire while the hose is being unreeled. This eliminates the time required to turn on the valve after the hose is run out. Rounded surfaces of the reel prevent cutting or other damage to the hose. Universal mounting permits installation on walls, columns, ceilings or floors.

Circle No. 34 on Poscard

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Power Pipe Cutter

A new portable power pipe cutter made by SpringLoad Manufacturing Company is said to cut and bevel steel pipe in one operation, and also cut cast iron pipe without splits or breaks. Two cutter sizes are now available: one is for 6-, 8- and 10-inch pipe inclusive; the other for 12-, 14- and 16-inch pipe. The 6- to 10-inch cutter weighs approximately 80 pounds and can be taken apart for slipping under a pipe already in the ground. Acceptable power sources include a ¾-inch slow speed electric drill, the equivalent in an air drill, or a flexible shaft on a small gasoline motor geared to slow speed. The tool automatically increases its depth of cut with every revolution, and also compensates for out-of-ground pipe. It is held on the pipe with drive points which hold it firmly in position during cutting. Replaceable bits are of high speed steel.

Circle No. 35 on Postcard

Noise Detector

Elec-Detec, an electronic stethoscope made by Anco Instrument Division, is used to locate friction noises in pipe lines, valves, bearings, pistons, etc. A metal probe serves as a microphone to localize the exact source of tell-tale noise for diagnosing equipment troubles. The instrument is furnished with high impedance type headphones, batteries, and leather carrying case.

Circle No. 36 on Postcard

•

Plastic Packing

An extruded Teflon plastic packing has been designed by Flexrock Company for difficult packing applications. It may be used in centrifugal pumps handling acids, caustics and hard-to-handle solvents, operating at varying speeds up to 3500 revolutions per minute. Teflon plastic packing #403 is composed of shredded Teflon, Blue Asbestos, combined with binders and lubricants and extruded into an open cotton yarn jacket.

Circle No. 37 on Postcard

•

Pyrometer

A portable diesel engine pyrometer introduced by The Bristol Company is designed for test purposes and for installations where no permanently mounted pyrometer is available. Thermocouples can be installed in each cylinder and in the main exhaust line. Temperatures can then be checked at any time by inserting the pyrometer prongs into the corresponding receptacles in the terminal head of the thermocouple.

Circle No. 38 on Postcard

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YES, IT PAYS to remember that Composite Catalog is available at both ends of the line. It is used by buyers to place orders, and by supply stores to fill orders. More than 500 manufacturers have filed information on 3000 products in the latest (1952) edition. Next time you contact your supply store for equipment, refer to the page and item number listed in your Composite Catalog.

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P. O. BOX 2608 **HOUSTON, TEXAS**

NEW LITERATURE

Copies may be obtained easily and without cost by using Reader Service Postcard. Just circle on the card the number at the end of each item in which you are interested. The convenient postcards are on page 73.

Coupling

De Laval Steam Turbine Company has issued a four-page bulletin on its Crown Coupling. The bulletin gives complete information on construction, horsepower ratings, speeds, applications and selection.

Circle No. 39 on Postcard

•

Construction Equipment

A folder on the truck-mounted Bantam, made by Shield Bantam Company, presents actual job applications and production records of Bantam owners, with illustrations of their machines in operation. The machine can be used as back hoe, pile driver, clamshell, dragline, shovel, crane, magnet crane and with various grapples.

Circle No. 40 on Postcard

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Tachometer

Data on one- to five-range mechanical hand tachometers and single-range chronometric speed indicators are contained in a new bulletin available from Associated Research, Inc.

Circle No. 41 on Postcard

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Combustion Safeguards

A new bulletin released by Selas Corporation of America describes two protective devices, automatic fire check and safety blowout, used in the piping systems of gas- and air-combustion systems.

Circle No. 42 on Postcard

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pH Control

The Foxboro Company has issued a review of pH theory and its practical applications in industrial measurement and control. A step-by-step explanation of the units employed in the pH control cycle is given.

Circle No. 43 on Postcard

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Filter

Graver Water Conditioning Company has published a bulletin on pressure type filters for removal of visible suspended matter from water. The units are built in both vertical and horizontal types.

Circle No. 44 on Postcard

Stampings

"Stampings in Small Lots" is the title of HPL Manufacturing Company's new folder, which shows how the HPL Fast-Tooling process permits rapid production of stamped parts for experimental or development work in quantities from 25 to 25,000.

Circle No. 45 on Postcard

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Hydraulic Tools

A comprehensive job-picture book showing how hydraulic tools can be used in production, construction and maintenance—the "Idea Book"—has been published by Blackhawk Manufacturing Company. Among the equipment discussed are "Porto-Power" remotely controlled hydraulic jack equipment; gauge-equipped and standard hydraulic jacks, Blackhawk pipe benders, knockout punches, hydraulic pumps, torque indicators and hand tools.

Circle No. 46 on Postcard

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Arc Welder

Information on engineering improvements and application refinements of the Type RA direct current arc welder are offered in a new 12-page booklet available from Westinghouse Electric Corporation.

Circle No. 47 on Postcard

•

Standard Gauges

Gauges and valves for several applications are described in a new Jerguson Gage & Valve Company catalog folder. Reflex, transparent, and tubular glass gauges are listed, as well as special application instruments. Valves for instrument piping and accessories are illustrated.

Circle No. 48 on Postcard

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Thermometers

A new two-color thermometer specifications catalog has been prepared by the Instrument and Gauge division of The Electric Auto-Lite Company. The complete list of Auto-Lite recording thermometers and gauges, as well as dial indicating thermometers, is included.

Circle No. 49 on Postcard

Heat Enclosures

Heat enclosure methods are treated in detail in a new booklet available from M. H. Detrick Company. Historical development of heat enclosure is traced, and a section shows how this knowledge is applied to present-day systems. Graphs and tables are presented to aid selection of the proper equipment for given conditions.

Circle No. 50 on Postcard

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Surface Coatings

The Acheson Colloids Company, manufacturer of "dag" colloidal graphite dispersions, has released a six-page, two-color bulletin on "Colloidal Graphite for Surface Coatings and Impregnation."

Circle No. 51 on Postcard

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Pump Applications

A reference chart on small pump applications, issued by Tuthill Pump Company, lists in tabular form the various types of Tuthill pumps, services for which each is built, performance characteristics, types of packing, styles of mounting, and distinguishing features.

Circle No. 52 on Postcard

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Die-Formed Rings

A catalog sheet available from Abbott & Biddle gives information on new plastic semi-metallic die-formed rings.

Circle No. 53 on Postcard

•

Air Pumps

A new bulletin on air pressure or vacuum pumps for laboratory applications has been published by Eberbach Corporation. The bulletin gives performance and size specifications, suggested uses and illustrated descriptions of unmounted and motor-mounted models.

Circle No. 54 on Postcard

•

Protective Gloves

A new catalog showing how to choose the right protective glove for the job is available from Pioneer Rubber Company.

Circle No. 55 on Postcard

Anadarko Basin

A Problem of Exploration by Drilling

Vast Frontier Is Wide Open to Wildcatters and Offers Potential Pool in Many Thick and Porous Sands

By ALBERT S. CLINKSCALES
Independent Geologist
Oklahoma City

THE Anadarko Basin still remains a great oil region which will have to be explored by drilling to develop the major geologic features and discover its producing areas. Recent discoveries have focused the eyes of major oil companies on the less prospected parts of the basin, and important tests have recently been announced to give impetus and renewed efforts to evaluate some of the hitherto unexplored portions.

The location of the Anadarko basin is already well known to the oil fraternity, but reference is made to the accompanying map (Figure 1) from the Oklahoma Geological Survey's files, which will show its general outline and extent. This vast territory embraces some 70,000 to 80,000 square miles. It occupies parts of the Texas Panhandle, southwestern Kansas and western Oklahoma. It is intended to exclude from these remarks the proven and semi-proven districts, such as the Cement and Golden Trend areas of McLean and Garvin Counties, Oklahoma. Attention is directed particularly to the search being carried on north of the Wichita-Amarillo uplift and east of the Hugoton Gas belt and all of western Oklahoma lying west of Oklahoma City.

Prospecting this country by geological and geophysical methods has been in progress for years. More recently exploratory drilling has been intensified. This has brought to light some of the general features and characteristics of the basin. The deepest part has long been known to lie along the Wichita-Amarillo Mountain chain and steeply dipping sedimentary beds are found all along the north side of this uplift. From the bottom of this trough sedimentary rocks gently rise to the north and west toward the extremities of the basin, the northwest flank of which may be roughly located near the boundary lines of Colorado and southwestern Kansas. These sedimentary rocks consist chiefly of marine beds of Paleozoic age. They range in ascending order from the Cambrian to the Permian over most of the basin. A thin section of Mesozoic age rocks and some Tertiary and deposits of recent material are present in its northwestern part. Along the deep trough in Oklahoma, more than four miles of sedimentaries exist, and in the deepest portion, more than 32,000 feet of marine sediments are assumed to be present.

Development in the Anadarko has been retarded because favorable areas have been difficult to determine from a geologic standpoint. Rocks exposed on the surface do not permit reliable mapping to be accomplished; therefore, sufficiently conclusive evidence could not be obtained to warrant expensive drilling. In recent years this great territory has been adjudged largely from geophysical mapping. This method has not proven too reliable either, as over a large part of the basin the shallow sediments contain evaporites. Results obtained from seismic work have been extremely difficult to interpret, and this detriment is still a potent factor to be reckoned with in evaluating almost all of the western two-thirds of the basin.

More specifically, it has been found that only small sections of Beckham, Washita and Roger Mills counties in Oklahoma have responded favorably to seismic mapping, and this is also true of the Texas Panhandle counties. In areas near the trough accurate determination has been possible in some instances only as low as the upper beds of the Deese formation, which is in the middle Pennsylvanian. Most of the basin's major features are still unknown to the geologist or geophysicist. The presence of regional highs and shelves with truncated lower formations are still to be outlined. So far the amount of territory evaluated by drilling, both in Oklahoma and Texas, is very minor. Wells which have penetrated as deep as the basal part of the Pennsylvanian in western Oklahoma average only about one well to each six townships, or one well to each 225 square miles.

Development Retarded

It should be apparent from this that we have just begun this huge evaluation job. That the major oil companies realize the magnitude of this undertaking is evident by the number of co-operative units which have been formed for testing favorably considered localities. That they fully appreciate the enormous possibilities for returns is manifest by the huge investment in undeveloped oil and gas leases held by them. In the central part of the Anadarko it has been estimated that more than 70 percent of the land is now under lease. In western Oklahoma this amounts to some 9 to 10 million acres. The status of the Texas Panhandle counties is believed to be leased approximately equally as high percentagewise. Property owners receive a valued annual return on their lands, which are more or less under continual lease. Renewal bonuses come up periodically each five and ten years. That the basin is of tremendous importance is further evidenced by the appearance annually of new companies coming in to acquire and prospect new portions of its territory.

Stratigraphy And Structure

Beginning with the Quartermaster, the highest member of the Permian, a well drilled in the central part of the basin would penetrate practically all of the Paleozoic rocks. Perhaps as good an example to point out would be Magnolia Petroleum Company's well drilled in Section 9-T19N-20W in Dewey County, Okla. This well penetrated some 4850 feet of Permian sediments, about 5450 feet of Pennsylvanian, 2675 feet of Mississippian, 325 feet of Silurian and Devonian and 510 feet of Ordovician. After drilling about 80 feet of hard and tight Wil-

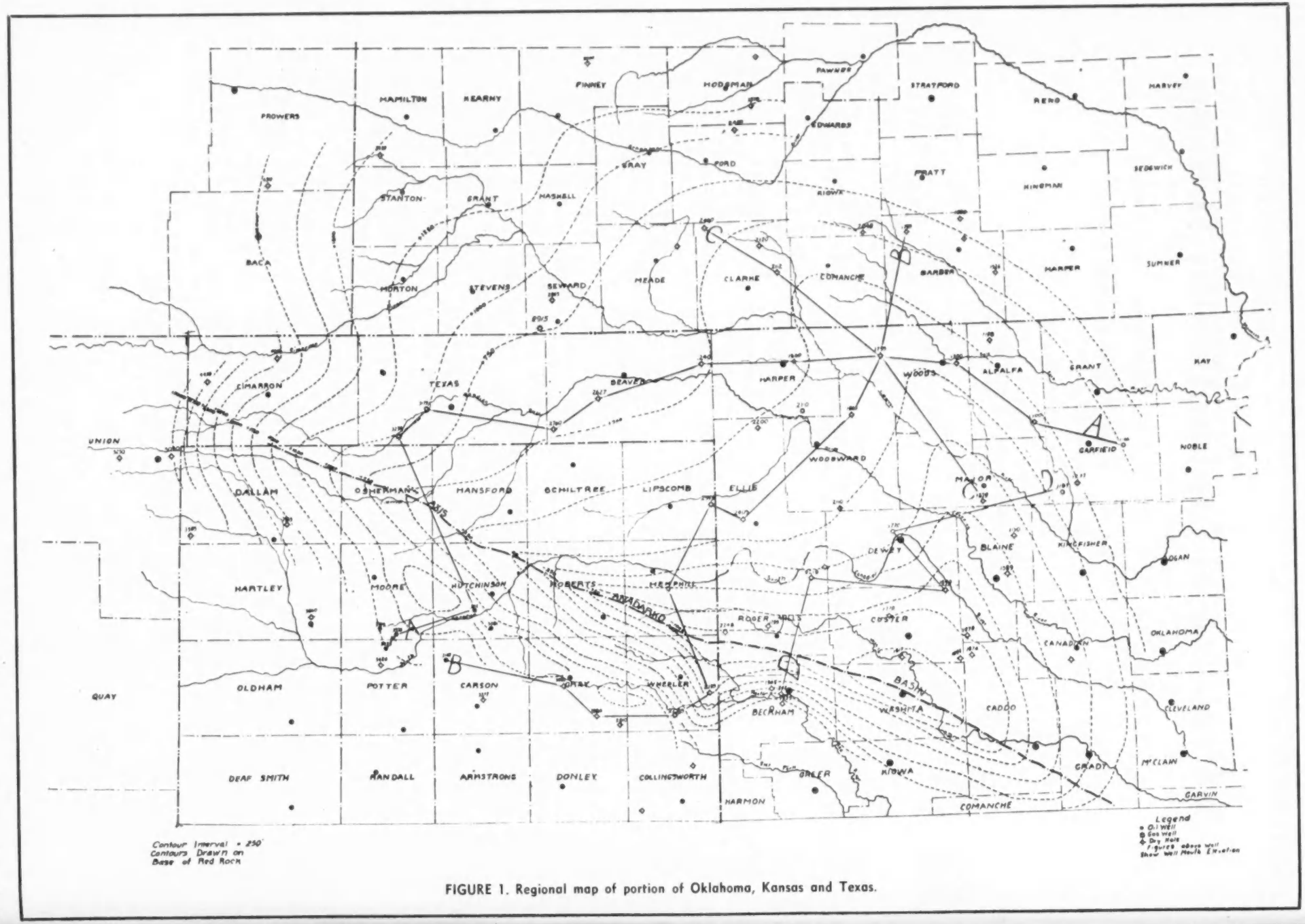

FIGURE 1. Regional map of portion of Oklahoma, Kansas and Texas.

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The Effect of FILTER SETTINGS

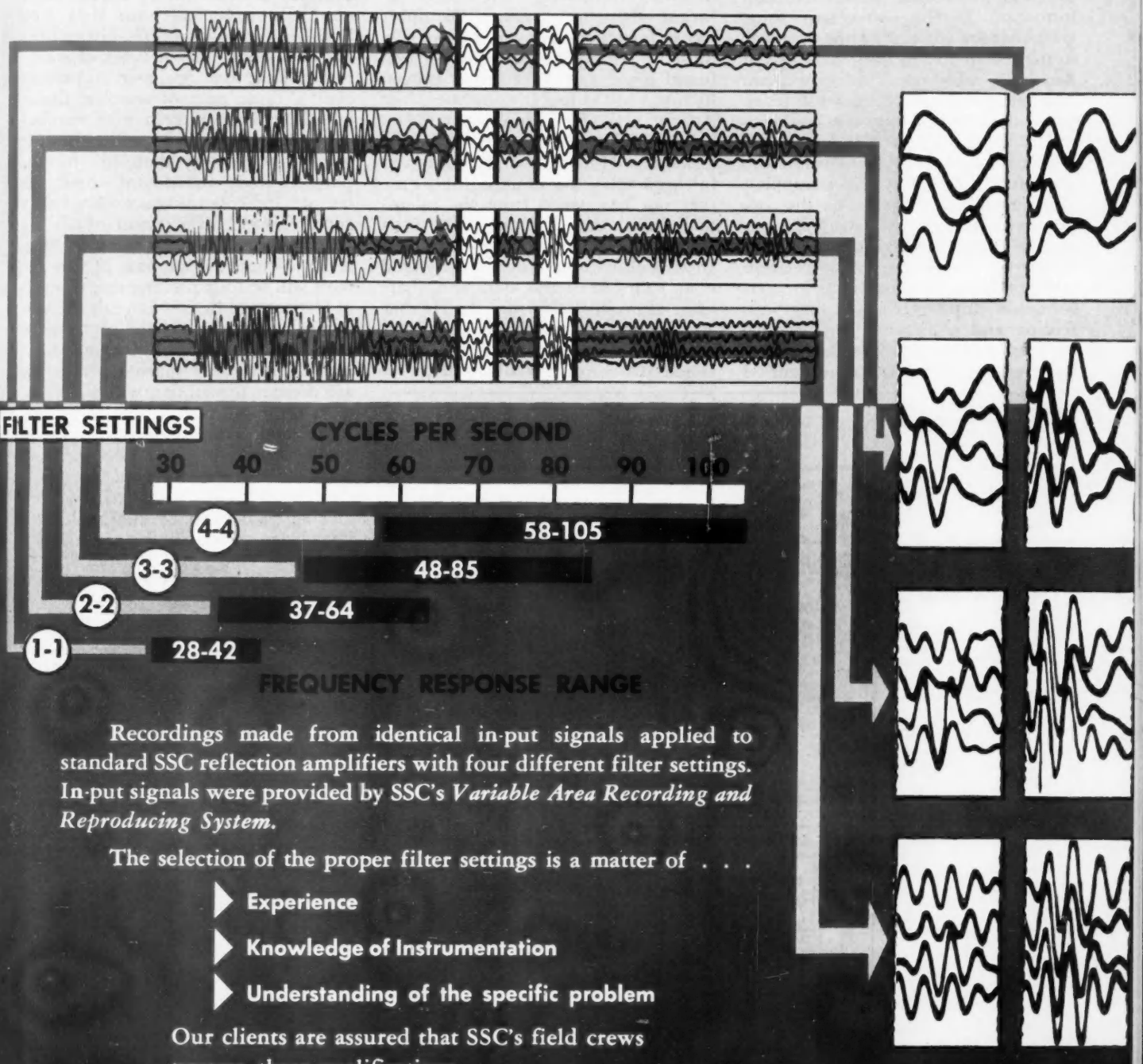

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FIGURE 1. Regional map of portion of Oklahoma, Kansas and Texas.

1952

cox sand of the Simpson formation it was finally abandoned at a depth of 13,810 feet. How much more Simpson and Arbuckle lime was present below its total depth is of course not known. A correlation chart (Figure 2) shows the depths and intervals in this well. Some important zones and pertinent information are indicated under "Remarks."

Throughout the basin regional unconformities are known to exist at the base of the Pontotoc, the Pennsylvanian, the Woodford, and also at the top and the bottom of the Hunton formation. In this connection, some geologists are correlating the Springer formation in the western part of the Anadarko with upper Mississippian. Maravich shows the Springer in place below the unconformity zone and correlates the Springer to Chester in age. It seems logical to place it below the unconformity and in the Mississippian although he has shown it on the correlation chart in its generally accepted place (Pennsylvanian). However, regardless of correct correlation position these interruptions in conformable deposition coupled with folding and truncation can produce productive areas of oil and gas of large extent. This fact is recognized by all geologists and geophysicists. Along the northwest rim or boundary stratigraphic traps should occur due to the convergence of beds in that direction.

On the southern side of the basin along the north side of the Wichita-Amarillo Mountain front, overlapping Pontotoc and Hoxbar conglomerate beds are present. Taking the form of weathered granite washes, these offer a long stretch of territory or belt to prospect for productive fields. However, the complexity of the faulted mountain front lying immediately adjacent on the north side of the uplift has so far made discoveries extremely difficult. Where production has been found along this front it has proven highly valuable; for instance, the Apache field of Caddo County, Okla. Small productive areas exist in the locality of Hobart, but these have so far been relatively unimportant. Further out basinward from the mountain front, these conglomerate beds offer thick oil reservoirs under closed structural features. The Elk City field is an example of this type and character of production, from the Hoxbar and Deese formations.

In the central part of the basin closed structures probably will be required to obtain production. Referring again to the location and findings in Magnolia's Winters well in Dewey County, a great deal of territory lying north and west from this well appears particularly inviting to test for the Springer sand. Springer sand undoubtedly pinches out in a north and west direction. This fact is apparent from the Oklahoma City Geological Society's cross-sections which were recently published and available to all. It may be inferred that a considerable portion of Woodward and Dewey counties is underlain by the Springer sand. Basinward from this well Springer production probably will occur only under closed types of structures. That the Springer is present over a large part of western Oklahoma has been proven in a number of widely separated wells. In the Winters well more than 185 feet of porous sand was found, and the samples indicated it was an unusually good reservoir for accumulation.

In other parts of the basin, in time, it is reasonable to suppose productive reefs will be found. A number of wells in Harper and Beaver Counties, Oklahoma, have indicated the presence of this type of material. Undoubtedly, where the proper marine conditions are present production will occur.

As the basin is explored it becomes more and more evident that the geologist and the geophysicist should work in closest association. Geophysical mapping can be refined, checked and supplemented by the geologist's knowledge of the subsurface and his formation studies in each section of the basin. Close co-operation in selecting locations for tests seems of vital importance as far as the Anadarko is concerned. Companies stressing co-operation and planning in these two branches of exploration are eliminating some of the factors of error, and their exploration program reflects a much more progressive plan.

MAGNOLIA WINTERS #1		AGE	GEOLOGIC FORMATION	U.S. STANDARD SECTION	REMARKS
SEC. 9 - 19 N - 20 W					
DEPTH	INTERVAL				
	530	PERMIAN	WHITE HORSE (WOODWARD)	GUADALOUPE	
	1705		ENID		
3075	840		WELLINGTON	LEONARD	ANHYDRITE SECTION PANHANDLE DOL. SECTION
5675	2600		PONTOTOC	WOLFCAMP	CHASE GROUP
				VIRGIL	
	725	PENNSYLVANIAN	VIRGIL		
8285	1885		CANYON	MISSOURI	LANSING - KANSAS CITY SERIES HOXBAR GRANITE WASHES SEVERAL 100' THICK
	830		OSWEGO - CHEROKEE		OSWEGO - MARMATON LS. B'VILLE OR RED FORK SD.
	535		ATOKA	DES MOINES	SANDS & SHALES
	475		L. DORNICK HILLS	MORROW	UNCONFORMITY SDS. 25'-150' THICK
10,300	185		SPRINGER	SPRINGER	POROUS SANDS 50'-300' THICK
11,610	1310	MISSISSIPPIAN	CHESTER FORMATION	CHESTER	TRUNCATED SECTION RINGWOOD PAY ZONE
	1335		MISS. LS.	MERAMEC OSAGE	
12,975	30		WOODFORD	KINDERHOOK	
13,295	320	DEV. SILUR.	HUNTON GROUP		TRUNCATED
	90	ORDOVICIAN	SYLVAN		
	345		VIOLA	CINCINNATTI	
13,810 T.D.	20		(WILCOX SD)		SAND

FIGURE 2.

Possible Oil And Gas Reservoirs

Oil and gas may exist in rocks of all ages in the Anadarko from the top down. Perhaps the first possibility to be encountered may be the Panhandle dolomites of the Wellington group or upper Pontotoc beds of the Permian. They are present over a large part of the basin and are the productive zones in the Hugoton gas field. The next prospect with depth is the Chase group or series. The Chase has been a consistent producer in the northern Oklahoma pools, particularly along the Nemaha ridge.

All along the southern side of the Anadarko, the Hoxbar granite washes, hundreds of feet thick in many localities, offer important chances for good production. These granite wash zones

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range in age from the Chase in some instances to the lower beds of Des Moines age in others. They are the chief pay zones of Elk City, and Gulf's Haggard 2 in Roberts County, Texas, is a recent discovery in this zone. Though widely separated and miles apart, the pay zones may correspond more or less in age and stratigraphic position.

The Cherokee formation contains several sand bodies and is wide spread over most of the basin. It has indicated capability in a number of different localities. The Cherokee is Des Moines in age. The Atoka formation, also of Des Moines age, has several sand bodies where it is present and should prove productive under the right structural conditions. No important Atoka strikes have occurred in the Anadarko Basin area of Oklahoma as yet, but it is producing in Roberts County, Texas, on Sinclair Oil & Gas Company's Lips Ranch property.

The Morrow formation contains the so called "unconformity sands," which have already proved productive in a number of areas. It appears to be a good porous sand section with adequate permeability.

The Springer formation in the northwest part of the basin is of tremendous importance. The sand of the Springer is of exceptional thickness, and in several wells has shown good porosity and reservoir conditions. It is the most important drilling objective at present in western Oklahoma. Many tests are contemplated to test this horizon.

Beneath the regional unconformity zones, folding and wedge-outs may be expected along the boundaries of the Anadarko, particularly along the north and northwest flanks. Dr. Robert Wheeler, writing in the Oklahoma City Geological Society's monthly in October, 1951, said: "Any province so vast in area as the northern and western flanks of the Anadarko basin in which there have been numerous interruptions in deposition to create convergence, should have favorable possibilities. These must be worked out as new stratigraphic data are made available by drilling, but already it should be possible to show by convergence maps and porosity studies belts of wedge-out interest."

Any place in the region where present, rocks of Mississippian, Devonian, Silurian or Ordovician age contain reservoir conditions capable of producing oil and gas. Depth and the economic limit of drilling only prohibit their being explored. The Chester section of the Mississippian is the productive pay horizon in the Ringwood field of Major County, Okla. Perhaps even the middle or lower Mississippian lime will produce where truncated. The Hunton limestone group of Silurian-Devonian age will undoubtedly yield both oil and gas when found in the right position. The Simpson group in the upper part of the Orodovician is normally of course a tremendous reservoir for oil and gas. The north and west flanks of the basin permits testing to all of these lower rocks and down to the Arbuckle lime of Cambro-Ordovician age.

About the Author

ALBERT S. CLINKSCALES was graduated from the University of Oklahoma with a B.A. degree in geology in 1917. After serving in World War I he worked for several major oil companies in the Mid-Continent areas for about 10 years. In 1930 he went to Oklahoma City and established himself as an independent geologist and oil producer.

A lot of the exploration to date has been conducted where deep and expensive drilling has been required but where favorable data and multiple reservoir zones were known to be present.

Approximately 11 different wells have been drilled over an indicated high area present in northwest Beckham and southern Roger Mills Counties in Oklahoma. The results so far have been generally disappointing, as no production of sizable volume or extent has been found.

The localities for Springer production are so highly regarded that a number of Pennsylvanian tests are now drilling or scheduled for early commencement in Ellis, Dewey and Woodward counties. The recent discovery by Gulf in Roberts County, Texas, is proving the extreme importance of the Hoxbar granite washes and the wide stretch of country they underlie. The value of this strike is apparent from the behavior of Haggard Ranch 2, which showed 4 million cubic feet of gas in Dolomitic lime from 3955-3998 feet. The Brown-Dolomite (Chase) was logged from 4009-15 feet which is the total depth. The well flowed 78 barrels of 51 degree gravity crude in six hours, with 8½ million cubic feet of gas on its initial test. The Hazzard 1 has indicated two deeper pay levels about 6000 and 7200 feet, respectively. To the north the Sinclair Oil and Gas Company has developed gas reserves of tremendous value on a large structure on the Lipps Ranch in northern Roberts County. The production comes from sands in the Atoka. Wells gauging more than 50 million cubic feet per day of sweet gas have been completed and a ready market is available for the gas.

The Sinclair company has started a 12,500-foot test on a large block of leases in Hemphill County, Texas, where a favorable structure of large extent is indicated by seismic work. The test well is located in the southeast corner of Section 114, H&TC Survey. Phillips Petroleum Company, which has long sought production in the deeper basin counties of the Texas Panhandle, currently is developing gas production in southern Roberts and northern Gray Counties on the Hobart Ranch near Hoover. Hansford, Ochiltree and Lipscomb have a few tests going but are mainly leased.

An important north flank test is located in Woods County, Oklahoma, where the Prudential Oil Company will drill a well in Section 19-27n-16w. This was an arranged deal with Sinclair contributing acreage and money. It is contemplated to test the Simpson with an effective limit of 7500 feet. Of interest in this connection was the showings obtained in the Steward well drilled by Sinclair in 1929, located 2½ miles southeast from the present test. Shows were encountered in the Simpson around 7125 feet.

Farther west in Harper County, Oklahoma, Sunray Oil Corporation has opened a gas well in Wolfe 1 in Section 4-25n-25w at around 7200 feet in depth. Production is found in the Morrow. To the south in north Ellis County, Carter Oil Company has found gas in the Morrow at 8460-8520 feet, location being in Section 22-23n-24w. Continental Oil Company's discovery in the southwest corner of Major County is considered of major importance. The well is located in Section 30-16n-20w and is producing from the upper Mississippian Chester formation. Since completion it has increased in volume and potential. Several tests are expected to be drilled north and west of this well at an early date.

Beaver County, Oklahoma, has recently produced a number of discoveries, and consequently a spirited drilling campaign is underway. Carter Oil Company is now evaluating the Greenough area around the Emby

• CONTINUED ON PAGE 95

Steel

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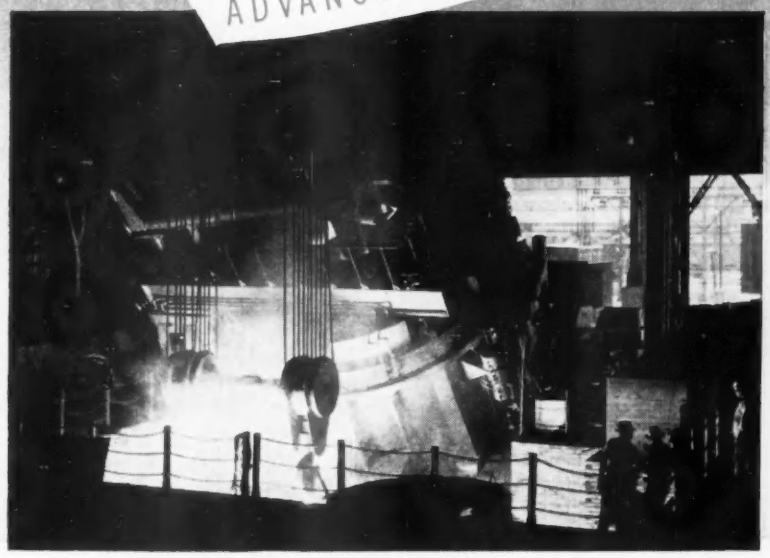

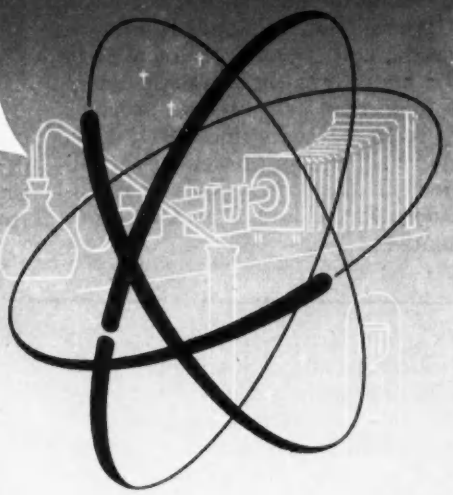

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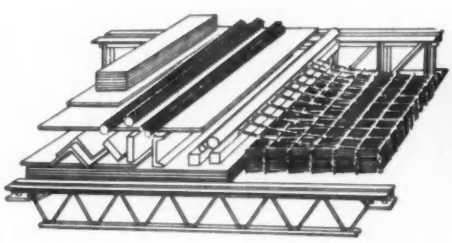

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Opportunity for Smaller Independents

The Eastern Interior Basin Offers Good Possibilities For Small Operators With Limited Capital

By R. M. ENGLISH
Consulting Geologist
Mattoon, Ill.

ALTHOUGH the independent oil operator has been active in the Eastern Interior Basin of Illinois, Indiana, and Kentucky, since the new "boom" commenced in 1937, his role in the development of this important petroliferous province has grown markedly since 1941, when major drilling was practically completed in the large pools, such as London, Salem and Clay City Consolidated.

Today the basin offers excellent possibilities for the smaller independent who has limited capital to venture in wildcat drilling. Numerous small, but prolific oil pools have "paid off" handsomely, and still many more will undoubtedly be discovered.

Table 1 shows well completions by major companies and independent operators from 1948 through 1951. It will be noted that the independent operator now drills more than 90 percent of wells completed in the basin. It is estimated that 20 percent of the wildcat tests drilled by independents are supported by major companies.

The basin will continue to be attractive to independent operators for the following reasons:

- Shallow depths to reach principal producing horizons near the center of the basin mean low drilling costs ($16,000 to $20,000 to drill to the McClosky—double this cost for a producer).
- Acreage prices are relatively high for long-term leases, but small blocks of 160 to 400 acres that "fit" the independent can be put together, except in a few hot spots, for a well or perhaps a well plus a low bonus cost for short term leases.
- Recoveries of 3000 to 4000 barrels per acre are favorable, and initial potentials of 100 to as high as 1000 barrels per day (average 150 barrels), with no proration, mean quick payout of the investment.
- Water-flooding is within the financial realm of the independent operator, and may double his return over primary production.

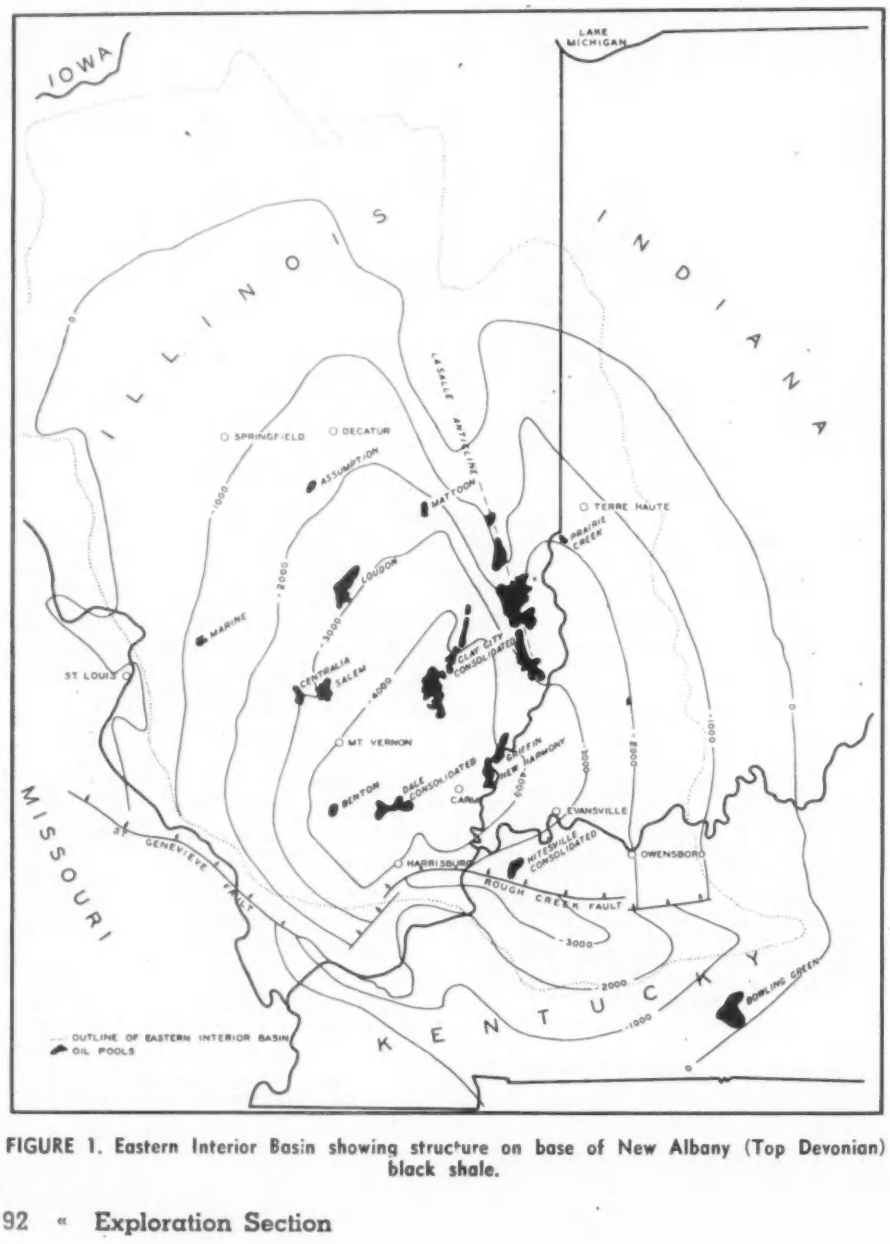

FIGURE 1. Eastern Interior Basin showing structure on base of New Albany (Top Devonian) black shale.

Basin Area

The Eastern Interior basin of Illinois, Indiana, and Kentucky covers approximately 50,000 square miles, of which 75 percent is in Illinois. Gentle folds are characteristic of the basin, except for two major features

TABLE 1
Well Completions in Eastern Interior Basin

YEAR	WILDCATS		TOTAL WELLS	
	Major Companies	Independent Operators	Major Companies	Independent Operators
1948	94	793	567	3539
1949	54	1016	525	4023
1950	62	1304	479	4850
1951	85	1405	400	4531

—the LaSalle anticline and the Rough Creek fault zone (Figure 1). The first is a major structure more than 100 miles long and has steep dips on the basinward flank. The Rough Creek fault zone is a series of faults, principally of the normal type, having as much as 2000 feet of displacement.

The basin is both structural and sedimentary. Greatest stratigraphic thickness is in southeastern Illinois and is offset a few miles southwest of the structural center of the basin. Starting with the Pennsylvanian, practically all the Paleozoic rocks are represented. The Pennsylvanian covers the entire basin area, and rocks of this age are the first encountered below a thin veneer of Pleistocene glacial drift. Only exception is in the extreme south, where the Cretaceous overlaps the Pennsylvanian.

Major oil development in the Eastern Interior basin has been in two stages. The first was from 1900-10 when pools along the LaSalle Anticline were developed. Peak year during the first stage was in 1908, when production averaged almost 100,000 barrels per day. The second or present stage began in 1937, and development shifted to the center of the basin. By 1936 production had declined to less than 11,000 barrels per day; but following an extensive exploratory and leasing campaign which began in 1934, new drilling resulted in discoveries near the center of the basin and production started increasing in 1937. Peak year since the second stage started was in 1940, when production in the basin averaged 418,000 barrels per day.

Approximately 1.7 billion barrels of oil has been produced from the basin, of which old pools along the LaSalle anticline have contributed approximately ½ billion barrels. New pools, or those discovered since 1937, have produced 1.2 billion barrels, and present production from the basin is 80 million barrels per year, or 220,000 barrels per day. Remaining reserves by primary methods are estimated at from ½ to ⅔ billion barrels. Waterflooding and other secondary recovery methods may double or even triple present remaining reserves.

During 1951, a total of 171 new pools and new horizons were added, for a wildcat success ratio of 11.4 percent. This compares with 163 discoveries and a success ratio of 11.8 percent for 1950. New discoveries, extensions and upward revisions of existing reserves for the past few years have about balanced production withdrawals.

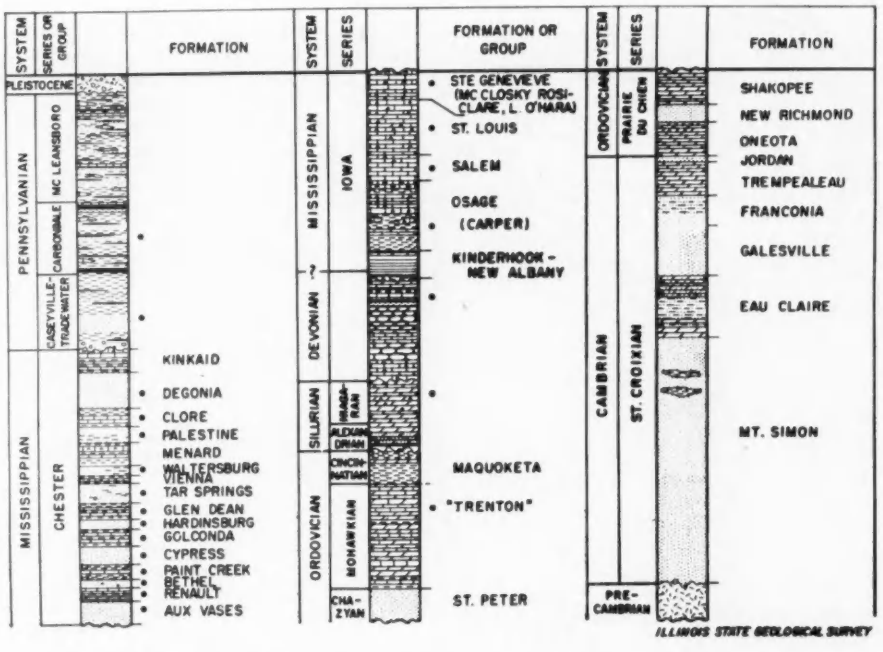

FIGURE 2. Geologic column for southern Illinois showing oil-producing strata.

Producing Formations and Types of Oil Traps

Since 1937, between 500 and 600 separate producing areas have been discovered. In many fields, several horizons are productive, and the number is greatest in extreme southeastern Illinois, in the vicinity of the New Harmony field. Eight separate sands in the Pennsylvanian and Chester as well as three oolitic zones in the St. Genevieve (L. O'Hara, Rosiclare, and McClosky) produce at New Harmony. Figure 2 shows producing formations of the basin. Approximately 90 percent of the oil discovered since 1937 has been in formations from the St. Genevieve (Lower Mississippian) and above. Of this total the Chester sands (Upper Mississippian) account for 68 percent and the McClosky oolitic limestones approximately 20 percent. Ten percent or practically all the remaining oil has been found in the Devonian.

25 Percent Sand

Approximately 25 percent of the Chester series is sand, but these sands are very lenticular, varying greatly in thickness and character from location to location in a pool. The oolitic limetones (McClosky, Rosiclare, and L. O'Hara) of the St. Genevieve exhibit the same lenticular qualities as the Chester sands. In the pools, average producing sections of Chester sands are 20 feet thick, while the oolitic lenses of the St. Genevieve are on the order of ten feet thick.

Oil traps of the basin are structural, porosity pinchout, and fault types, but because of the lenticularity of producing formations in the Chester and St. Genevieve, it is estimated that 70 percent of the traps are a combination of structure and porosity pinchout. In the Devonian, they are principally structural. Porosity in the Devonian limestone is both vugular and intergranular.

Average depth to the Middle Chester (Cypress sand) in the basin is 2500 feet, and to the McClosky, 2900 feet. The Devonian produces north of the center of the basin, near and above the —3000-foot contour in Figure 1, and on structures which so far have had at least 50 feet of closure. Because these structures are in a relatively shallow part of the basin, average producing depth to the Devonian is only 3300 feet. Large structures near the center of the basin, where the Devonian is 5000 feet deep, have been tested but found barren in this formation, because of the absence of porosity and permeability.

Future Possibilities

Best prospects for new pools in the basin are in presently established producing horizons. Reef structure pools with reserves of a few thousand to 10 million barrels have been found on the west and east flanks of the basin. Thirteen reef pools have now been found in Illinois and 15 in Indiana. Silurian reefs form structures on which produce the overlying Devonian, and in some cases the porous reef rock. Most successful method of

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exploration for these relatively steep structures has been with the seismograph. The west side of the basin is seeing considerable seismic exploration at the present time, and additional reef structures as well as normally folded structures will be located.

Center Area Best

However, the best area for new pools and extensions is near the center of the basin, where the McClosky oolitic horizons and the many sands of the Chester and Pennsylvanian are productive. On Figure 1, which shows only a few of the largest pools, the best area falls within the —2000-foot contour line and north of the Rough Creek fault zone. New pools and extensions in this area will be in the 100,000 to 2,000,000-barrel class, with an occasional 5- to 10-million barrel discovery. Subsurface and seismic exploration will continue to be successful in finding these pools. The less expensive subsurface methods, if done in careful detail, seems to yield as good results as the more expensive seismic method. This is true because of the low relief structures and the lenticular nature of producing horizons. For subsurface study, electric logs are available on more than 90 percent (and samples on a great many) of the 50,000 wells that have been drilled in the basin since 1937.

Secondary Recovery

Secondary recovery, principally water flooding, is in its early stages in the basin, but there seems little doubt that such operations will add greatly to the recoverable oil from present pools. There are now approximately 50 water-flood projects in operation. Formations being flooded include Pennsylvanian sands, Chester sands—Waltersburg, Tar Springs, Cypress, Bethel and Aux Vases—and McClosky oolitic limestones. Depths range from the 400-foot Pennsylvanian sands in pools along the LaSalle anticline to the 3350-foot McClosky limestone of the Aden pool near the center of the basin. McClosky floods are the "dump" or uncontrolled type. The following is quoted from Illinois Geological Survey Circular No. 165[1]:

"On January 1, 1950, Illinois had 31 active controlled floods. These, together with the many McClosky dump floods, had produced about 15,400,000 barrels of flood oil to January 1, 1950. This oil was obtained from sands with an average thickness of about 20 feet, which took water at the rate of ten barrels per day per foot. Porosties average about 20 percent, and permeabilities approximately 150 millidarcys. Fluid saturation at the start of flooding averaged 64 percent oil and 20 percent water, and the ratio of water input to flood oil produced was about 5 to 1 at the end of 1949. The over-all recovery to January 1, 1950, from the 8450 acres in the controlled floods was 1213 barrels per acre. The last figure is very encouraging, considering the early stage of many of the floods. As only a small part of the state's total oil producing area of 376,000 acres has been affected by controlled water floods, there remains an extensive territory which has good prospects for oil recovery by water flooding."

REFERENCES

[1] Frederick Squires and Members of the Secondary Recovery Study Committee for Illinois, Secondary Recovery Division, Interstate Oil Compact Commission—"Summary of Water Flood Operations in Illinois:" Illinois Geological Survey Circular No. 165. pp. 3, 1950.

ACKNOWLEDGEMENT

The writer wishes to express appreciation to Lloyd A. Harris, English & Harris, and Carl E. Moses, Moses & Stewart, for facts and ideas contributed and for helpful criticism of the manuscript.

About the Author

R. M. ENGLISH was graduated from the University of Oklahoma in 1933 with a B.S. degree in geology. After working four years in Oklahoma and Michigan for The Carter Oil Company he was transferred to the Eastern Interior Basin of Illinois, Indiana and Kentucky in 1937. In January, 1951, he resigned as division geologist for Carter at Mattoon, Ill., and with L. A. Harris formed the firm of English and Harris, consulting geologists. He is a member of the AAPG.

Anadarko Basin

• CONTINUED FROM PAGE 90

Kaye discovery. The discovery is in Section 31-6n-22eCM. The east offset confirms the existence of a pool. Production comes from the Marmaton or Oswego lime zone. Pure Oil Company has a potential discovery in their Alberts well in Section 16-5n-26eCM, which showed five million or so of gas at 6030 feet. Flynn Oil Company's well in Section 35-5n-23eCM is a Marmaton lime producer. The extent of production is still in doubt, although two offsets were disappointing. Sinclair is also active in Beaver County, Oklahoma, where it took over a block from the Cabot Carbon Company to drill a 9500′ test. Location is SW NE 26-5n-24eCM.

Another location of great interest to western Oklahoma is Continental's Berryman Ranch, NW SW Section 15-17n-23w, southern Ellis County.

An important wildcat has recently been announced also for Caddo County, being located in Section 31-12n-13w on the old Weatherford anticline. It is scheduled to go some 12,000 feet. And Magnolia Petroleum Company after extensive seismic work in TWP 15n-16w Dewey County is supporting a deal with H. L. Hunt to penetrate the Pennsylvanian in Section 22 of that township.

In conclusion, it may be said that the Anadarko basin is wide open to the wildcatter to drill, to explore and to develop. It is still a frontier almost without limit. Here multiple sand reservoirs exist to excite his interest. Lying at varying depths within its boundaries, many are unusually thick and porous. Here weather conditions are ideal for year round operation. In this respect, few of the other great geocynclines have such mild climatic conditions. Any part of the Anadarko is accessible by road and permits movement by all types of transportation carriers. Fuel, water and pipe lines are within easy reach, and a properly financed venture can be readily carried to completion. These benefits all reduce the cost and well may be considered in allocating new venture capital or appropriations for exploratory drilling. In addition the major oil companies are openly encouraging exploration. They are providing information and contributing acreage and finance to numbers of active operations now and also many scheduled for an early start.

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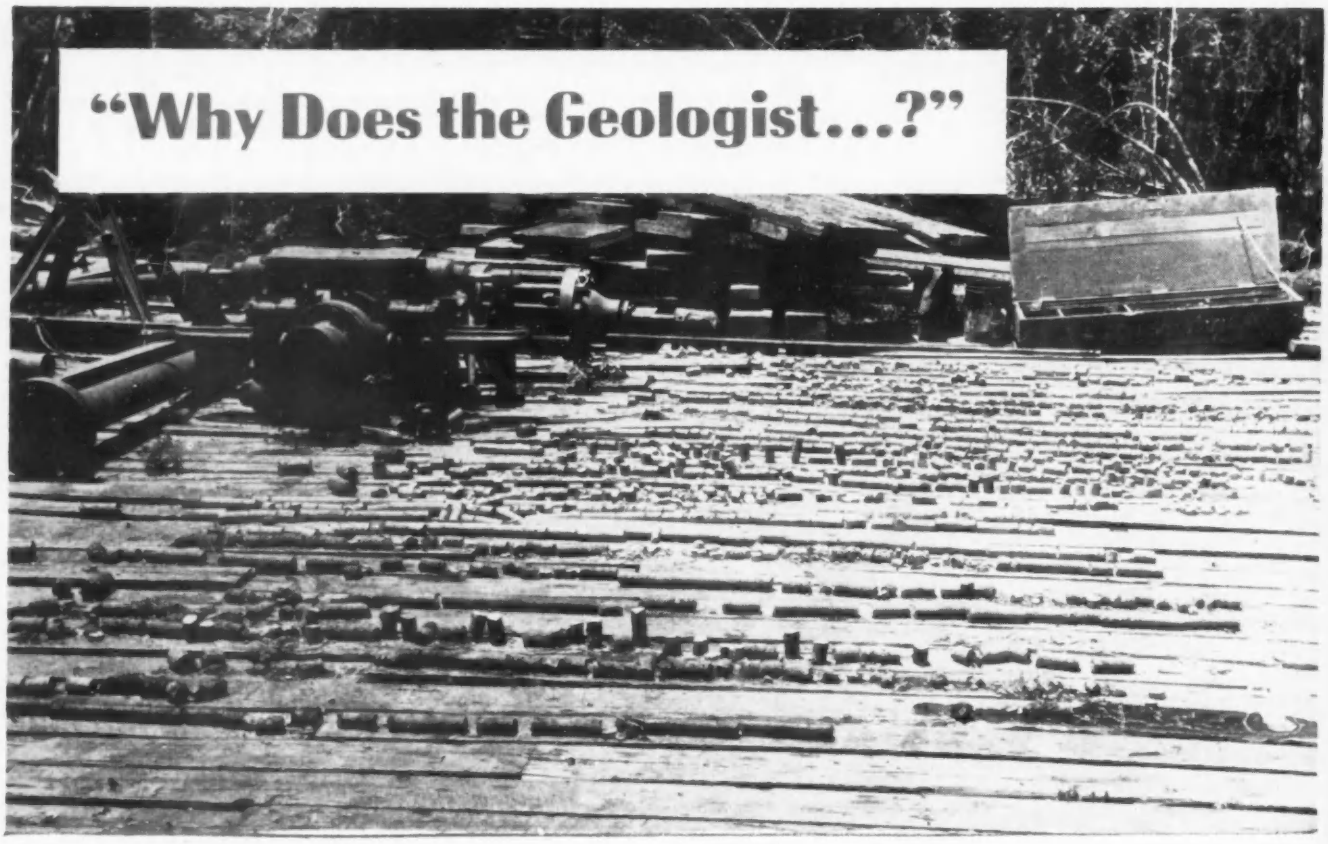
The writer is indebted to the companies and members of their technical staffs who contributed much of the data for the above remarks.

"Why Does the Geologist...?"



Why does the geologist want more cores, especially after drill pipe has been laid and the rig is ready to run casing? Often a source of headaches for drilling and production men, these requests are vital to process of finding and verifying new reserves.

THE ROLE of geological interpretation and decision often is stalemated by basic but lengthy investigation. WORLD OIL asked an eminent and qualified member of the profession to prepare this straightforward manuscript presenting the other side of the story. It is our sincere hope that this discussion will permit a better understanding of the why and wherefore of delayed geological decision.

WHY does the geologist . . . ?" These four words, or slightly more—if you add a few well chosen adjectives—start many questions usually asked by the production and drilling departments of any oil company.

Why does the geologist issue incomprehensible orders such as hundreds of feet of additional hole after the depth objective has been reached and plugging or casing operations are in progress and drill pipe has been laid down? Why does he ever order an electric log run shortly after a new bit is on bottom? Why does he think the samples are terrible? Who is he to say the water loss of the mud is too high? Why does he want oil emulsion mud kept out of the hole? Why does he constantly ask for more cores? Why does he need perforations retested?

In the minds of the drilling and production departments, why does the geologist slow up the drilling and completion of wells with what may seem unreasonable and unnecessary instructions and requests? These all may seem foolish, they may seem to interfere with getting the hole dug and completed in the shortest possible time. In fact, these orders, complaints and comments may at times seem insane.

But there is usually sound reasoning behind each and every one of them stemming from one or more branches of the geologic department —exploration, exploitation, paleontological or research sections. These units work closely together. Although their immediate interests vary, their main objective is that of the company as a whole—to find new reserves and develop present reserves economically.

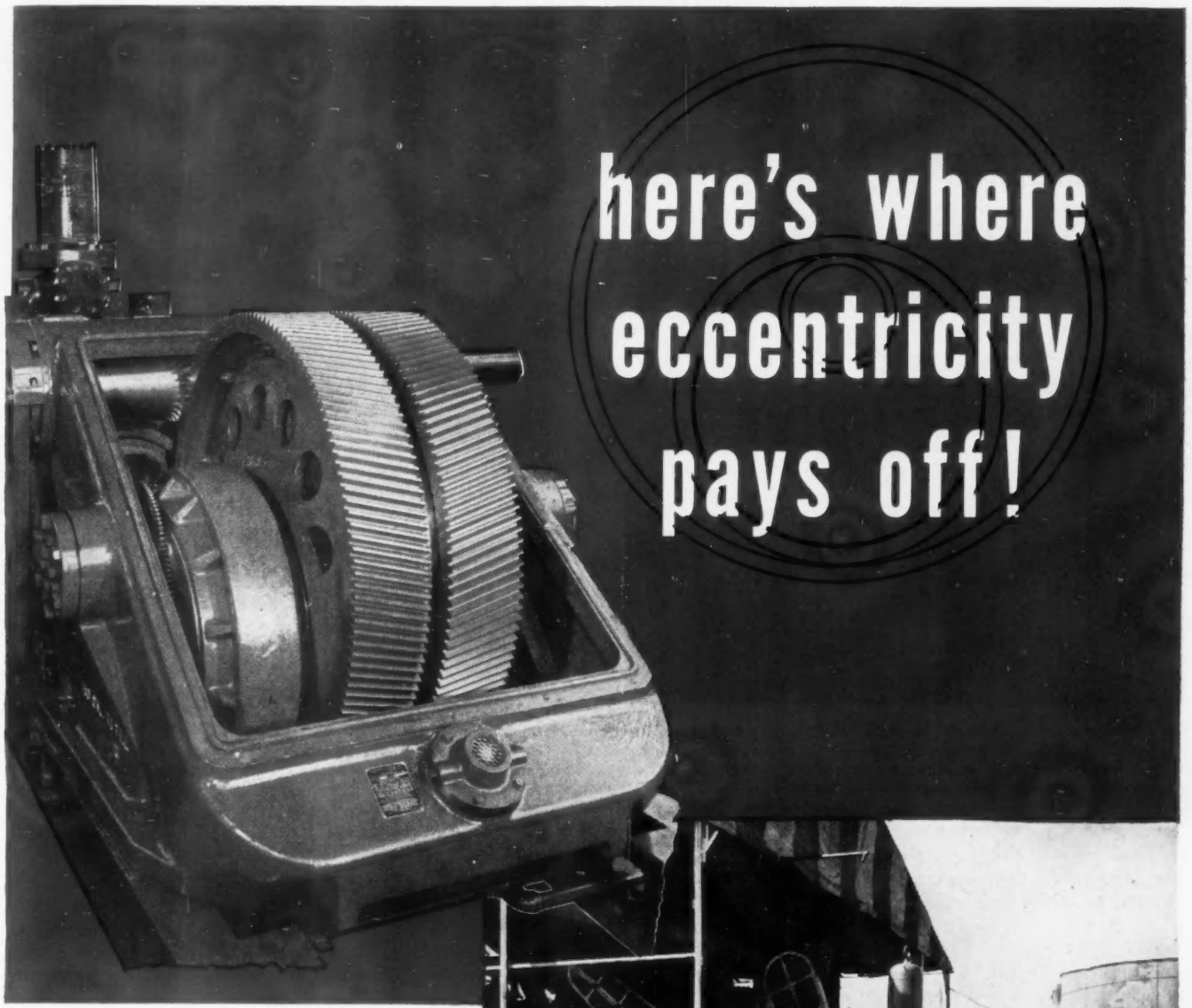
Consider some of these questions individually.

Another Hundred Feet? Why does the geologist invariably want another 100 feet of hole just before plugging? In the last core out or the sample caught off bottom, there may be a paleo marker which is a strong indication of additional sand section. Therefore, it is certainly advisable to drill deeper than planned. Or it could be that following the running of a final electric log, the correlations revealed either a thickening or thinning of the section. If the section is thickening, a fault is possibly being approached or the well is off structure. To make certain, the well should be carried on down. If the well shows thinning, the structural picture will possibly be changed. If a fault can be tied down more accurately, a good chance for a drillable structure may be found to the east, west, north or south through reinterpretation.

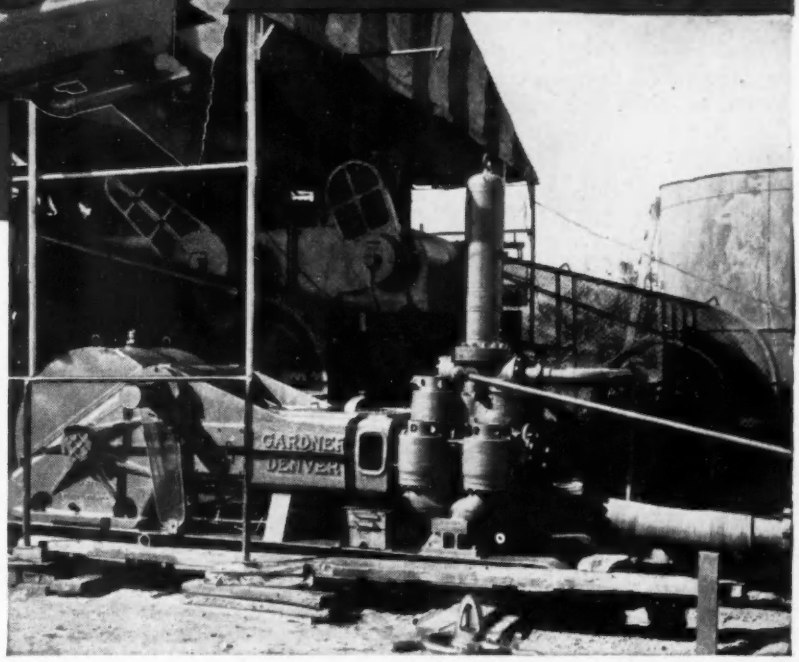
A definite marker may be needed by the exploration or research geologist for a regional play. The exploitation geologist may feel that a sand productive in a nearby field will be productive in this field.

Why Electric Log? Why is a log run shortly after a new bit is placed on bottom? A paleological marker may be found in the cuttings indicating that a high pressure zone is being approached and the projected casing point will be higher than expected. A marker may show up as a result of crossing a fault indicating that the coring point should be started higher. This can be tied down through electric log correlation.

Research personnel may need a



here's where eccentricity pays off!



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THE QUALITY LEADER IN COMPRESSORS, PUMPS AND ROCK DRILLS

LEFT. Cooperation between the geologist, drilling tool and production representatives is important in log interpretation if only for sake of future operational planning. Sometimes the geologist is not agreeable to this exchange of information. However, this spirit is seldom seen in field operations. RIGHT. Sidewall coring is an important tool to the geologist. Fullest use of the equipment is seen in Gulf Coast operations where the geologist employs the sidewall sample in closer coordination of electric log and offset location data. Often it is felt that the introduction of oil emulsion mud may influence sidewall samples; hence, the geologist may insist that this type drilling fluid not be used.

definite marker for a large regional play and can obtain it accurately only from an electric log. And of course, someone up the line of authority may decide that enough hole has been drilled without an electric log and orders are issued for immediate action. In most cases if a logging point is established and the bottom runs out 30 feet short or long, it will not make too much difference to run the log at that time; however, the geological department should be consulted.

Why The Mud? Why does the geologist scream about the mud? It is admitted that it is not his problem to keep the mud heavy enough or in condition to make the most hole in the shortest time or to keep the pipe from sticking. However, a lot of hole will not help him if it is impossible to interpret the log or side wall cores. If the water loss is high, a low pressure or bentonitic sand may be water blocked, therefore, it canont be produced. This type programming leads to the question—why drill the well?

Lost circulation material, which is necessary at times, is put in many wells for no real reason. The practice generally fouls up well cuttings as the mud stream cannot pass through the shale shaker screen in sufficient volumes to catch representative samples.

If oil emulsion mud is introduced in a wildcat or exploratory well to increase the drilling rate, a lot of hole will not help if the side wall, conventional, wire line or diamond cores cannot be analyzed adequately by physical inspection. It must be remembered that cores are one of the geologist's best tools.

Why Core A Sand? Why does the geologist recommend coring a sand—especially a sand that has been cored many times before? It may be felt that the oil-water contact will be found in the well from location on the structural interpretation. Some coring may be done to aid the reservoir engineers in their calculations. Coring may be advisable to check electric log kicks on an off-set well which may be suspected to have oil or gas.

Never Say Die on Perforations. Why does the geologist never say die on a set of perforations? The cores of a sand in conjunction with the electric log do not indicate the origin of formational water. Actually, water might be feeding from another sand and retesting the sand productivity will save future testing in other wells. Then, some lease commitments may make it easier by attempting to get any sort of commercial production.

How About Samples? Why does the geologist say that the samples are terrible? If samples are not properly labeled and caught, a high pressure zone may be penetrated accidentally due to a lack of paleontological markers or a fault may be crossed since poor markers may not permit immediate pickup, thus passing a coring point or penetrating a dangerous zone. Through markers the production department can be notified approximately of a logging point and will have time to get the rig ready for coring or running casing.

Room for Improvement. Around rigs, some geologists are really individuals who should have stayed in the office. You have seen those that come out to look at a core. They drive up to the rig, sit in their car until the core is out of the barrel. Then they go up to the floor and inspect the core. After recording a description of the core in their field book, they yell at the driller "cut another ten feet," walk off the floor without another word and sit in the car until the next core is out. There is no reason for this sort of action. This type geologist is one of those who writes an order in the log book without giving any explanation for it, and often it is difficult for the driller to interpret his scrawl. He is the same one who grabs the film of an electric log, goes in the bunk house or his car, makes a correlation for himself and no one else around the rig.

Why does the geologist . . . ?

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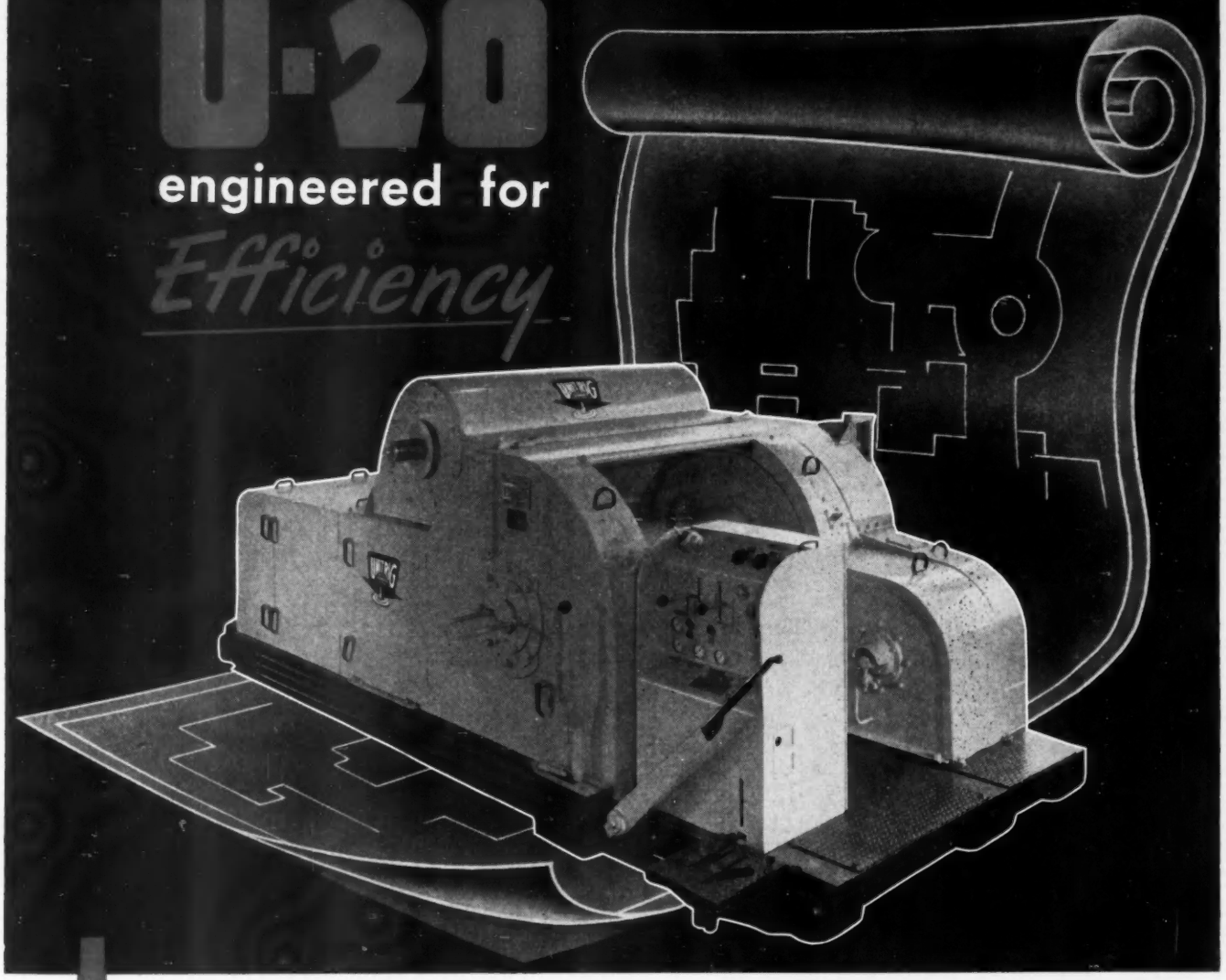

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Exploration Reaches 1952 Peak in July

THE industry completed 959 exploratory tests during July to make it the most active month of this year and to boost the seven months' total wells into a 7.6 percent lead over those completed in last year's comparable period. The month's efforts were a little more successful than had been the previous month's, but still did not quite live up to the year's average.

July's tests yielded 165 producers, 138 discoveries and 27 major extensions. Those productive tests amounted to 17.2 percent of the 959 completed, and they topped the 150 completed during June that amounted to only 15.9 percent of the 946 completed. However, in the first seven months of this year 18.7 percent of all exploratory wells drilled were successful.

The month's efforts were rewarded with 114 new oil pools, 97 new fields and 17 new pay horizons in old fields. Also on the credit side were 11 new distillate pools, 10 new fields and 1 new pay, and 13 new gas sources. Of the 27 successful extensions, 25 expanded the boundaries of oil fields and the other two extended gas fields.

So far this year, exploratory tests completed have totaled 6206 against 5768 recorded in the same period of 1951. That amounted to a gain of 7.6 percent and set a new mark for the first seven months of any year. Of this year's wells, 1163 found the pay and amounted to 18.7 percent of the total. At the same time a year ago, 1087 wells had been successful and they amounted to a slightly better 18.8 percent.

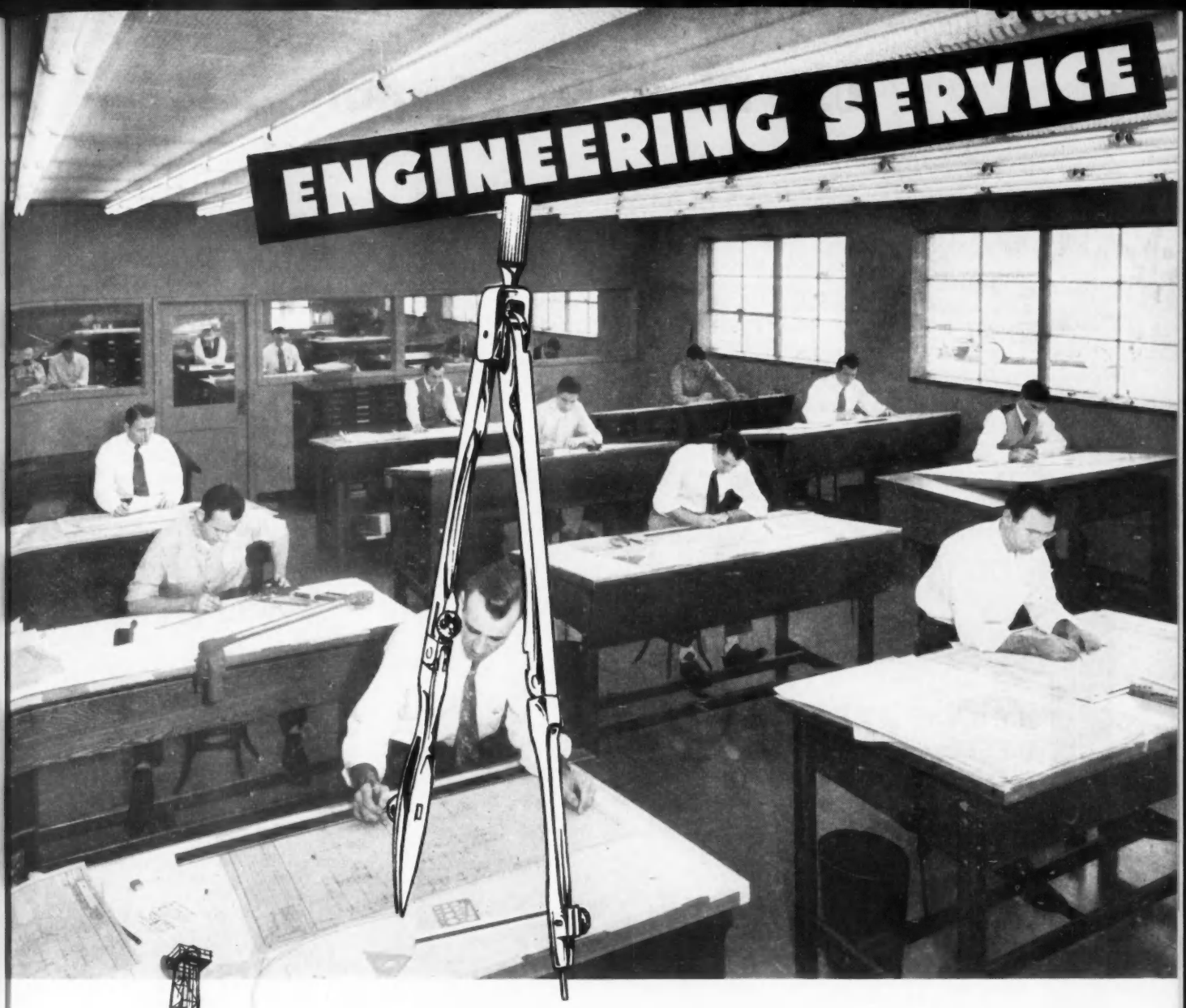
The year's 757 new oil pools were only 2 better than last year's 755. However, this year 576 of those pools have been in entirely new areas, while only 554 were a year earlier. The remainders were new pools opened in previously discovered areas.

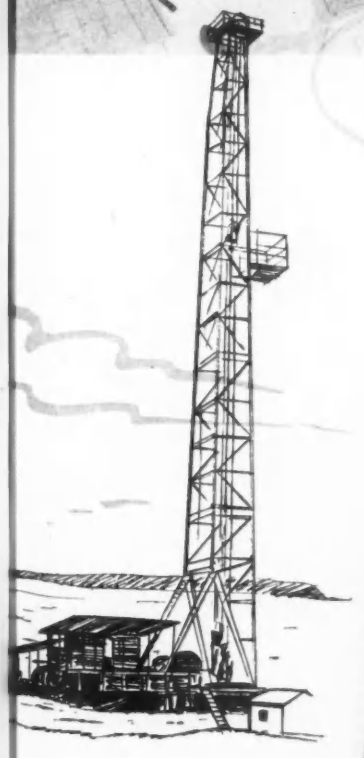
Summary of Results of Exploratory Drilling

ITEM	July, 1952	June, 1952	SEVEN MONTHS January-July 1952	1951	Percent Diff.
Oil Discoveries	114	89	757	755	+ 0.3
New Fields	97	71	576	554	+ 4.0
New Pays	17	18	181	201	— 10.0
Distillate Discoveries	11	13	78	50	+ 56.0
New Fields	10	12	69	34	+102.9
New Pays	1	1	9	16	— 43.8
Gas Discoveries	13	20	114	119	— 4.2
New Fields	12	16	91	96	— 5.2
New Pays	1	4	23	23	0
Total Discoveries	138	122	949	924	+ 2.7
Extensions to Fields	27	28	214	163	+ 31.3
Oil Fields	25	21	178	124	+ 43.5
Distillate Fields	.....	1	6	11	— 45.5
Gas Fields	2	6	30	28	+ 7.1
Total Prod. Tests	165	150	1163	1087	+ 7.0
Dry Holes	794	796	5043	4681	+ 7.7
Wildcats	785	776	4844	4445	+ 9.0
New Pays	.....	2	11	9	+ 22.2
Outposts	9	18	188	227	— 17.2
Total Explt'ory Tests	959	946	6206	5768	+ 7.6
Percent Productive	17.4	15.9	18.7	18.8	.....
Percent Dry	82.8	84.1	81.3	81.2	.....

Results of Exploratory Drilling in July and First 7 Months, 1952-1951, by Districts

State or District	MONTH OF JULY, 1952													FIRST SEVEN MONTHS, 1952																
	Productive Tests									Total Produc-tive	Unproductive Tests			Total Ex-plora-tory Test	Productive Tests								Total Produc-tive		Unproductive Tests			Total Dry		Total Explora-tory Tests	
	New Fields			New Pays			Extensions								New Fields			New Pays			Extensions									
	Oil	Lis.	Gas	Oil	Dis.	Gas	Oil	Dis.	Gas		Wild-cats	New Pays	Out-posts		Oil	Lis.	Gas	Oil	Dis.	Gas	Oil	Lis.	Gas	7 Mo. 1952	7 Mo. 1951	Wild-cats	New Pays	Out-posts	7 Mo. 1952	7 Mo. 1951	7 Mo. 1952	7 Mo. 1951
Alabama	...	...	...	...	...	...	...	...	...	...	4	...	...	4	1	...	1	...	...	...	...	...	...	2	3	21	...	...	21	9	23	12
Arizona	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	1	...	...	...	...	1	2	1	2
Arkansas	...	...	...	...	...	...	1	...	...	1	11	...	...	12	7	...	1	...	...	2	1	...	...	11	13	50	...	1	51	54	62	67
California	4	...	1	1	...	...	2	...	...	8	31	...	...	39	18	...	4	16	...	...	18	...	2	58	38	193	2	23	220	281	278	319
Colorado	...	...	...	...	...	...	...	...	...	...	17	...	...	17	7	1	3	3	...	2	2	...	...	18	8	96	...	2	98	62	116	70
Florida	...	...	...	...	...	...	...	...	...	...	2	...	...	2	...	...	...	...	...	...	...	...	...	...	...	6	...	...	6	2	6	2
Idaho	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	1	...	1
Illinois	...	...	...	...	...	...	8	...	...	8	54	...	...	62	13	...	...	11	...	...	27	...	...	51	50	299	...	...	299	384	350	434
Indiana	4	...	...	...	...	...	2	...	...	6	23	...	...	29	10	...	...	2	...	...	9	...	...	21	29	193	...	2	195	186	216	215
Kansas	15	...	1	1	...	...	...	...	...	17	93	...	...	110	72	1	7	7	...	...	1	...	...	88	120	508	...	...	508	457	596	577
Kentucky	3	...	...	...	...	...	...	...	...	3	10	...	...	13	15	...	...	1	...	...	4	...	...	20	25	69	...	...	69	105	89	128
Louisiana	2	3	...	1	...	...	...	...	...	6	34	...	...	40	22	16	3	10	3	...	2	...	2	58	56	196	1	3	200	181	258	237
North Louisiana	...	2	...	1	...	...	...	...	...	3	17	...	...	20	8	4	3	6	3	...	1	...	1	26	23	100	...	3	103	112	129	135
South Louisiana	2	1	...	...	...	...	...	...	...	3	17	...	...	20	14	12	...	4	...	...	1	...	1	32	33	96	1	...	97	69	129	102
Michigan	2	...	1	...	...	1	2	...	...	6	26	...	...	32	12	...	1	5	...	3	4	...	1	26	13	142	...	...	142	176	168	189
Mississippi	1	...	...	...	...	...	...	...	...	1	19	...	...	20	8	2	...	2	...	1	2	...	...	15	11	92	...	3	95	73	110	84
Missouri	...	...	...	...	...	...	...	...	...	...	3	...	...	3	...	...	...	...	...	...	...	...	...	...	...	14	...	...	14	...	14	...
Montana	1	...	...	...	...	...	...	...	...	1	6	...	...	7	2	...	1	...	...	...	2	...	...	5	4	27	...	2	29	21	34	25
Nebraska	...	...	...	...	...	...	...	...	...	...	2	...	...	2	4	...	...	1	...	...	2	...	...	7	11	49	1	2	52	34	59	45
Nevada	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	2	...	2
New Mexico	3	...	...	...	...	...	...	...	...	3	9	...	...	12	13	2	9	6	1	3	6	...	...	40	22	68	1	1	70	47	110	69
North Dakota	...	...	...	...	...	...	...	...	...	...	...	...	...	...	3	...	...	...	...	...	5	...	...	8	1	4	...	...	4	3	12	4
Ohio	...	...	...	...	...	...	2	...	...	2	5	...	...	7	...	...	1	...	...	...	2	...	6	9	5	21	...	...	21	15	30	20
Oklahoma	7	1	...	4	...	...	1	...	...	13	65	...	...	78	45	6	8	24	...	1	26	1	2	113	83	416	...	...	416	356	529	439
Pennsylvania	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	1	2	...	...	2	...	2	1
South Dakota	...	...	...	...	...	...	...	...	...	...	1	...	...	1	...	...	...	...	...	...	...	...	...	...	...	2	...	...	2	...	2	...
Tennessee	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	6	...	6
Texas	55	6	9	10	1	...	7	...	2	90	346	...	9	445	320	39	51	88	5	11	63	5	17	599	573	2285	6	147	2437	2150	3036	2723
Dist. 1 S. Central	1	...	...	...	...	...	...	...	...	1	22	...	...	23	9	2	1	1	...	1	2	...	1	17	21	177	...	6	183	117	200	138
Dist. 2 Middle Gulf	3	2	...	...	...	...	...	...	1	6	24	...	1	31	16	10	6	5	...	...	8	3	8	56	60	153	1	13	167	139	223	199
Dist. 3 Upper Gulf	4	1	1	3	...	...	...	...	...	9	22	...	1	32	17	13	6	31	2	6	...	2	4	81	59	180	...	13	193	164	27	223
Dist. 4 L. Gulf-Sw	5	3	4	2	1	...	...	...	...	15	33	...	...	48	19	9	16	9	2	2	4	...	3	64	85	244	3	11	258	227	322	311
Dist. 5 E. Central	...	...	...	...	...	...	...	...	...	1	14	...	...	15	3	1	...	...	...	...	...	...	...	4	12	65	...	2	67	103	71	116
Dist. 6 Northeast	...	...	1	...	...	...	...	...	...	1	9	...	...	10	5	2	1	7	...	...	2	...	...	17	14	78	...	2	80	49	97	63
Dist. 7-B N. Cent.	18	...	1	...	...	...	...	...	...	19	87	...	...	106	101	2	11	3	1	2	2	...	...	122	133	563	...	8	571	545	693	678
Dist. 7-C W. Cent.	7	...	...	...	...	...	2	...	...	9	35	...	...	44	43	...	...	3	4	...	12	...	...	62	45	233	...	3	236	169	298	214
Dist. 8 West	8	...	1	3	...	...	2	...	1	15	38	...	1	54	35	...	...	1	14	...	23	...	1	77	58	229	1	4	234	229	311	287
Dist. 9 North	9	...	1	2	...	...	3	...	...	15	60	...	6	81	69	...	...	5	14	...	10	...	...	98	82	340	1	81	422	397	525	479
Dist. 10 Panhandle	...	...	...	...	...	...	...	...	...	...	1	...	...	1	...	...	...	1	...	...	...	...	...	1	5	17	...	4	21	10	22	15
Utah	...	...	...	...	...	...	...	...	...	...	8	...	...	8	...	...	...	...	...	...	...	...	...	...	1	27	...	...	27	12	27	13
West Virginia	...	...	...	...	...	...	...	...	...	...	...	...	...	...	1	...	...	...	...	...	...	...	...	1	2	3	...	...	3	1	4	3
Wyoming	...	...	...	...	...	...	...	...	...	...	16	...	...	16	3	2	1	5	...	...	2	...	...	13	20	59	...	2	61	61	74	81
Total U.S.	97	10	12	17	1	1	25	...	2	165	785	...	9	959	576	69	91	181	9	23	178	6	30	1163	1087	4844	11	188	5043	4681	6206	5768





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U.S. Discoveries in July

ARKANSAS—OIL FIELD EXTENSION

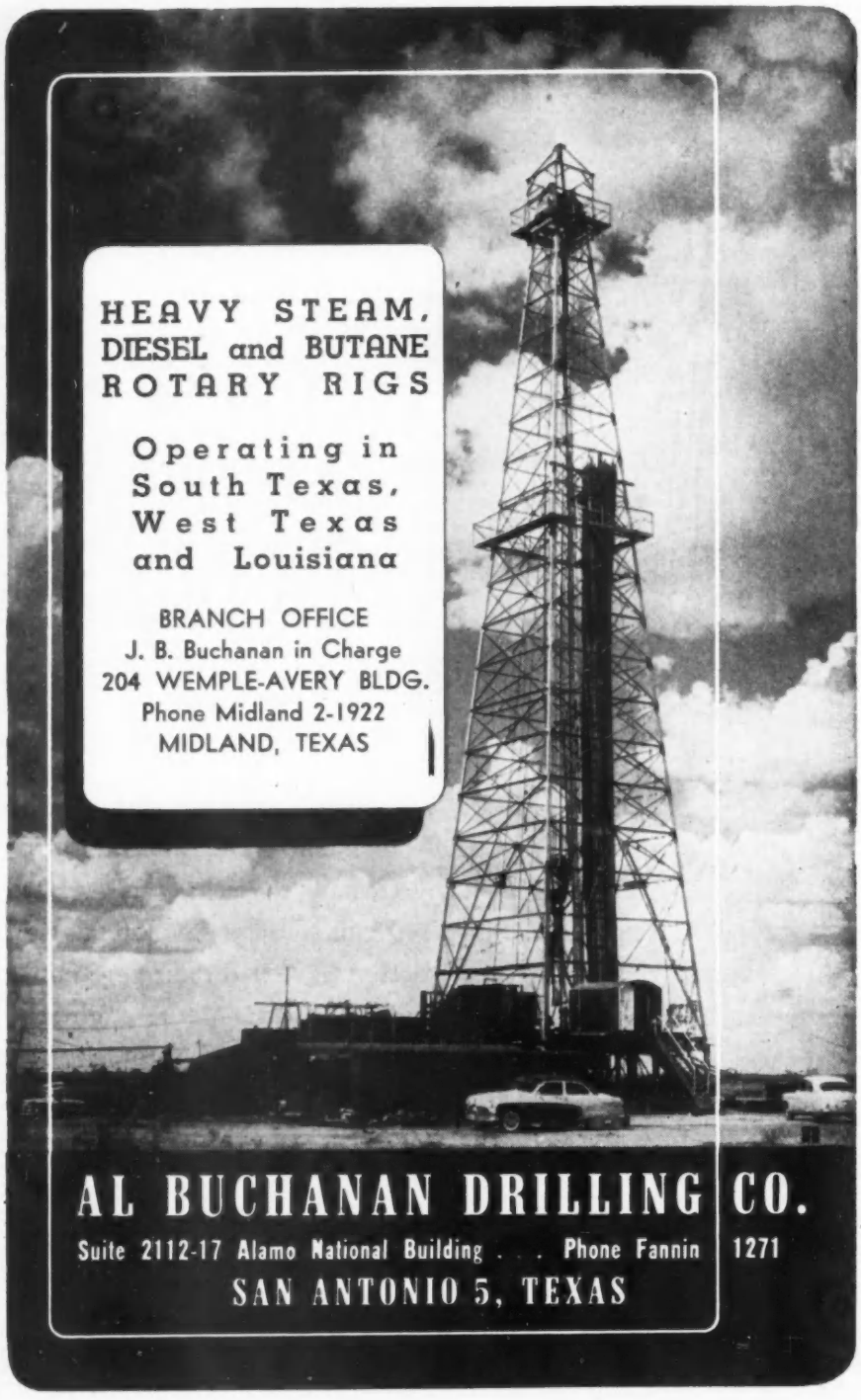
Ouachita County, Smackover field. Harris H. Pace & J. W. Coan et al's Reynolds-Gammill Lumber 1, C NW SE 28-15s-17w, ½-mile west extension, pumped 25 barrels oil and 100 barrels water from Graves sand, Upper Cretaceous 2409-2415 feet, completed 7-26-52, TD 4009.

CALIFORNIA—NEW OIL FIELDS

Kern County. D. K. Partnership's Corral 88-20, in 20-11n-18w, pumped 207 barrels from Lower Miocene sand 2690-2717 feet and 2723-2733 feet, 14/64-inch, 36-gravity, completed 7-4-52, TD 3397.

Unnamed Field. Richfield Oil Corp's San Emidio 18-21, SW SW 21-11n-22w, flowed 225 barrels from Pliocene sand 7253-7280 feet, 24/64-inch, 17.1-gravity, completed 7-9-52, TD 8006.

Los Angeles County, Santa Fe Springs area. Rothschild Oil Co.'s Tucker 1, in 5-3s-11w, pumped 25 barrels from 4585-4695 feet, 32-gravity, completed 7-11-52, TD 8082.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Ventura County, South Mountain area. The Ohio Oil Co.'s Mark Richardson 1, in 24-3n-21w, pumped 205 barrels from 4294-5714 feet, 18.3-gravity, completed 7-12-52, TD 5917.

CALIFORNIA—NEW OIL PAY

Los Angeles County, Santa Clara field. Southern California Petroleum Corp.'s N. L. & F. 1, in 20-4n-17w, old well drilled deeper, pumped 100 barrels from Del Valle sand, Miocene 9600-9972 feet, 31.8-gravity, completed 7-6-51, TD 9972.

CALIFORNIA—OIL FIELD EXTENSIONS

Kern County, Mountain View (Arvin, North) field. The Texas Co.'s Brandt (NCT-1) 1, in 24-31s-29e, ½-mile south extension, pumped 16 barrels from 6275-6300 feet, 30.4 gravity, completed 6-30-52, TD 6495.

Monterey County, San Ardo field. Pacific Western Oil Corp.'s Aurignac 1, in 33-22s-10e, ½-mile north extension, pumped 125 barrels from Aurignac sand, Miocene 2440-2486 feet, 13.8-gravity, completed 7-3-52, TD 2495.

CALIFORNIA—NEW GAS FIELD

Kern County. Standard Oil Co.'s Well 46-1Y, in 1-30s-21e, flowed 2.5 million from 1116-1331 feet, 1-inch, completed 6-11-52, TD 1800.

ILLINOIS—OIL FIELD EXTENSIONS

Edwards County, Mitchell field. A. J. Slagter, Jr.'s C. Vallette 1, NW NW SE 31-2s-10e, ½-mile south extension, pumped 15 barrels from McClosky lime, Mississippian 3315-3318 feet, completed 7-15-52, TD 3362.

Parkersburg Consolidated field. Ryan Oil Co.'s F. Abernathy et al 1, SW NW SE 32-2n-14w, ½-mile extension, pumped 32 barrels oil and 4 barrels water from Rosiclare lime, Mississippian 3087-3095 feet, completed 7-15-52, TD 3171.

Effingham County, Sailor Springs Consolidated field. J. L. Black's G. Stortzum 1, SE SE NW 22-6n-7e, ½-mile north extension, pumped 12 barrels oil and 4 barrels water from Cypress sand, Mississippian 2568-2574 feet, completed 7-8-52, TD 2578.

Hamilton County, Long Branch field. Calvert Drilling Co., Inc's H. E. Howard 1, SW NE NW 16-7s-6e, ¾-mile north extension, pumped 110 barrels from Aux Vases sand, Mississippian 3097-3106 feet, completed 7-22-52, TD 3106.

Jefferson County, Reservoir field. Cullum & Lawhead's Whitson 1, NE NE NW 21-1s-3e, 1-mile north extension, pumped 600 barrels from McClosky lime, Mississippian 2731-2736 feet, completed 7-22-52, TD 2736.

Lawrence County, Ruark, West field. W. Duncan's H. C. Albright 1, NE SW NW 12-2n-13w, old well worked over, ½-mile north extension, pumped 33 barrels from Bethel sand, Mississippian 2230-2244 feet, completed 7-8-52, TD 2453.

White County, Iron field. Noah Petroleum Co.'s E. A. Harrell Comm. 1, NW NW NE 14-6s-8e, 1-mile north extension, pumped 60 barrels from Hardinsburg sand, Mississippian 2610-2625 feet, completed 7-8-52, TD 2625.

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Your business is finding oil. Our business is instrumentation. It is up to us to provide you with the best instruments money can buy. Therefore our entire efforts and facilities are concentrated on the necessary RESEARCH, PRODUCTION DESIGN, MANUFACTURING TECHNIQUES and SERVICE PROGRAM to supply you with fine Seismograph Instruments and associated equipment.

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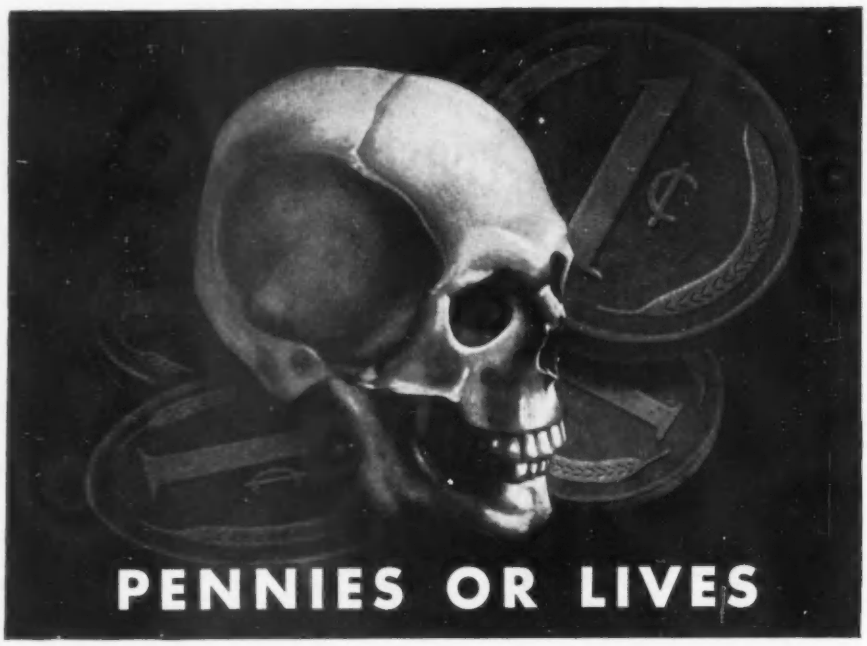

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Trumbull field. George & Wrather's M. M. Roser et al 1, SE NE NE 1-5s-8e, 1-mile north extension, pumped 58 barrels from Aux Vases sand, Mississippian 3174-3192 feet, completed 7-15-52, TD 3375.

INDIANA—NEW OIL FIELDS

Gibson County, Johnson, South field. Barron Kidd & A. W. Cherry & George Greer's Juanita Callard 1, in NE SW SE 12-3s-13w, pumped 14 barrels from Pennsylvanian sand 1081-1094 feet, TD 1243.

Unnamed field. Slagter Production Co.'s Richard Lefler 1, SE NE SE 25-3s-10w, swabbed 62 barrels from Cypress sand, Mississippian 1637-1658 feet, TD 1661.

Pike County. Slagter Production Co.'s H. A. Smith 1, NW NW SW 28-6s-14w, pumped 52 barrels from Degonia lime, Mississippian 1840-1854 feet and from Cypress lime, Mississippian 2475-2484 feet, TD 2484.

Vanderburgh County, Baker field. R. E. Hupp & Chester Oil Co.'s Frances Barker & Mabel Preston 1-A, SE NE NE 36-7s-11w, pumped 25 barrels oil and 35 barrels water from Cypress sand, Mississippian 2064-2073 feet, completed 7-31-52, TD 2076.

INDIANA—OIL FIELD EXTENSIONS

Knox County, Monroe City, South field. Dell Carroll's Dale Williams 1, SE SE NW 27-2n-8w, ¾-mile east extension, pumped 50 barrels from Aux Vases lime, Mississippian 1324-1329 feet, TD 1329.

Pike County, Mt. Vernon, South field. Indiana Farm Bureau Cooperative's Lydia Armbruster 1, SE NE SW 9-7s-13w, pumped 40 barrels from Jackson sand, Mississippian 2296-2314 feet, completed 7-17-52, TD 2781.

KANSAS—NEW OIL FIELDS

Barton County, Hawkins field. Rocket Drilling Co.'s Hawkins 1, NW NE NW 3-19s-13w, pumped 110 barrels from Arbuckle lime, Ordovician 3393-3395 feet, completed 7-52, TD 3395.

Unnamed field. B. & R. Drilling Co.'s Deutch 1, NW SW SW 32-19s-11w, pumped 50 barrels from Arbuckle lime, Ordovician 3345-3358 feet, TD 3358.

Butler County, Bare field. White & Ellis' Bare 1, SE SE NW 31-28s-5e, from Bartlesville sand, Pennsylvanian 2775-2815 feet, TD 2815.

Ellis County. Musgrove Petroleum Co.'s Rohleder 1, SW SE NE 17-14s-16w, pumped 259 barrels from Lansing-K C lime, Pennsylvanian 3215-3219 feet, TD 3431.

Rice County. W. L. Hartman's Bingham 1, NE NE NW 35-19s-9w, pumped 25 barrels from Arbuckle lime, Ordovician 3332-3340 feet, TD 3368.

Rooks County, Fehnel field. Champlin Refining Co.'s Fehnel 1, NW NE SW 16-10s-19w, pumped 245 barrels from Lansing-K C lime, Pennsylvanian 3480-3494 feet, TD 3730.

Mt. Avr field. Republic Natural Gas Co.'s Miller 1, NE NE SE 13-10s-18w, pumped 11 barrels from Lansing-K C lime, Pennsylvanian 3554-3566 feet, TD 3767.

Unnamed field. Champlin Refining Co.'s Brungardt 1, SE SE SE 35-10s-17w, pumped 223 barrels from Lansing-K C lime, Pennsylvanian 3194-3210 feet, TD 3601.

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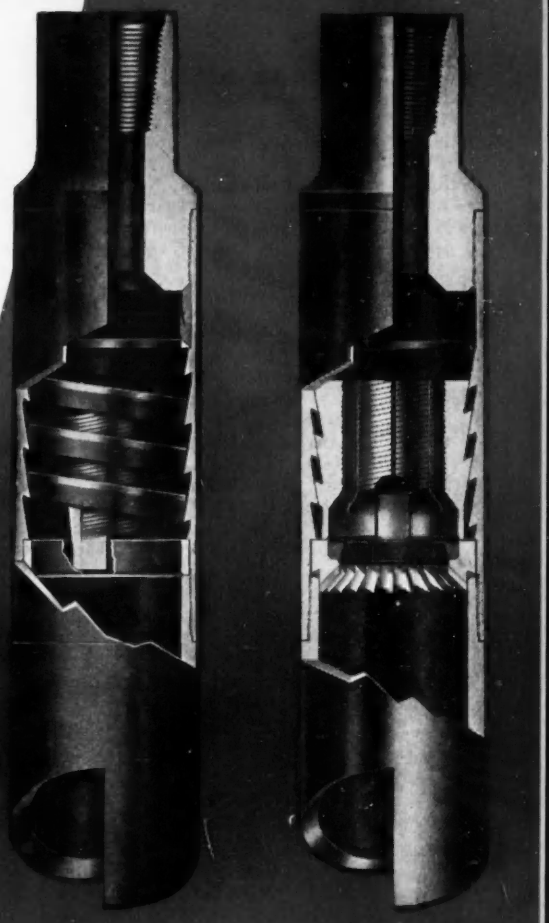

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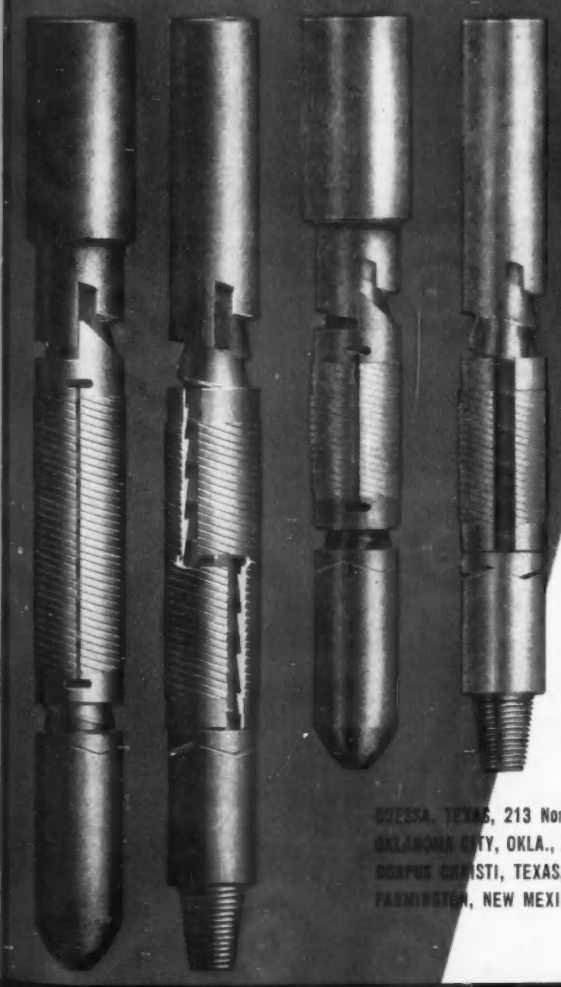

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FEATURES: Important advantages include its unusual strength; definite assurance of positive engagement with the fish; definite assurance it can be released when desired and then absolute confidence that the fish can be re-engaged after release.

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THE HEAVY DUTY MODEL with longer body and grapple presents twice as much supported wickered area in contact with the fish. Heavy duty models are available in all sizes, but only 3" and 3½" are carried in stock. Complete information — catalogs and operating instructions are available on request.

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WILLISTON, N. DAKOTA, 504 First Street West, Phone 522-W

Rush County, Timkin field. Ed Adair & Graham's Peterson 1, SE SE NW 28-18s-17w, pumped 259 barrels from Arbuckle lime, Ordovician 3729-3758 feet, TD 3758.

Saline County, Gypsum Creek, North field. E. K. Carey Drilling Co.'s Stein 1, SE NE NW 33-16s-1w, pumped 303 barrels from Mississippi lime, Mississippian 2594-2614 feet, TD 2614.

Sedgwick County, Gehring-Rick field. J. P. Gaty's Gehring 1, E/2 NE SW 16-28s-2e, pumped 5 barrels oil and 3 barrels water from Mississippi lime, Mississippian 2986-3011 feet, TD 3019.

Seward County. Flynn Oil Co.'s Jury 1, SE SE NW 26-33s-31w, flowed 55 barrels from Mississippi lime, Mississippian 5770-5860 feet, TD 5860.

Stafford County, Rose Valley field. M. B. Armer's Walters 1, SW SE SW 36-25s-13w, pumped 81 barrels from Lansing-K C lime, Pennsylvanian 3824-3830 feet, TD 4345.

St. John, Northwest field. Anschutz Drilling Co.'s Shultz 1, NE NE NW 20-23s-13w, pumped 114 barrels from Lansing-K C lime, Pennsylvanian 3634-3650 feet, TD 4023.

Unnamed field. Jackson Drilling Co.'s Crissman 1, NE NE SW 16-23s-14w, pumped 202 barrels from Lansing-K C lime, Pennsylvanian 3664-3672 feet, TD 4083.

KANSAS—NEW OIL PAY

Barton County, Kraft-Prusa field. National Cooperative Refinery Association's Joseph 5, NW NW NW 32-16s-11w, pumped 211 barrels from Douglas sand, Pennsylvanian 2997-3005 feet, TD 3005.

KANSAS—NEW GAS FIELD

Stafford County, Farmington, West field. Cities Service Oil Co.'s Westgate 1, NE SE NE 6-25s-15w, flowed 4.2 million from Pennsylvanian sand 4166-4184 and 4190-4207 feet, TD 4570.

KENTUCKY—NEW OIL FIELDS

Daviess County. Sun Oil Co.'s Leo Sandefur Committee 1, in 14-O-26, pumped 24 barrels from McClosky lime, Mississippian 2173-2181 feet, TD 2184.

Henderson County. C. B. Mansfield's Roberta Latta 1, in 19-P-21, pumped 75 barrels oil and 50 barrels water from Rosiclare lime, Mississippian 2568-2590 feet, TD 2594.

Unnamed field. G. W. Miller Drilling Co.'s Everett Overfield 1, NW NW NW 18-O-24, pumped 150 barrels from O'Hara lime, Mississippian 2454-2460 feet, TD 2617.

NORTH LOUISIANA—NEW OIL PAY

Claiborne Parish, Haynesville field. Joe B. White et al's Smith Unit 1, 18-23n-8w, Old Well Worked Over, flowed 374 barrels from Smackover "A" lime, Jurassic 10,365-10,385 feet. 12/64 inch, 44.5-gravity, completed 7-28-52, TD 10,721.

NORTH LOUISIANA—NEW DISTILLATE FIELDS

Bossier Parish, Redland field. Continental Oil Co.'s T. S. Goodwin 1, C SW NW 29-23n-12w, flowed 38 barrels distillate and 1.3 million from Travis Peak sand, Lower Cretaceous 7356-7366 and 7370-7380 feet, 14/64 inch, 65.2-gravity, completed 7-18-52, TD 11,302.

Lincoln Parish, Ruston, South field. Southwest Gas Production Co. & W. C. Feazel's Redwine 1, in 11-17n-3w, flowed 33 barrels distillate and 2.3 million from Hosston sand, Lower Cretaceous 9708-9716 feet, 16/64 inch, 40-gravity, completed 7-22-52, TD 10,638.

SOUTH LOUISIANA—NEW OIL FIELDS

Allen Parish. Richardson & Bass' Shell-Luma Darbonne 1, in 19-5s-3w, flowed 227 barrels from Wilcox sand, Eocene 11,976-11,986 feet, 11/64 inch, 47.3-gravity, completed 7-23-52, TD 16,070.

Rapides Parish. The California Co.'s Long Bell Petroleum Co. Inc. 1, NW NW NW 9-1n-3w, flowed 290 barrels from Wilcox sand, Eocene 9390-9405 feet, 9/64 inch, 46.0-gravity, TD 10,300.

SOUTH LOUISIANA—NEW DISTILLATE FIELD

Calcasieu Parish. The California Co.'s Domitile Pujol et al 1, in 18-9s-7w, flowed 130 barrels distillate and 3.7 million from 10,466-499 feet, 10/64 inch, 44.9-gravity, TD 11,250.

MICHIGAN—NEW OIL FIELDS

Oceana County. McClure Oil Co.'s McClain 1, NW SE SE 14-16n-17w, Weare Township, pumped 7 barrels from Traverse lime, Devonian 1672-1675 feet, TD 1675.

Wexford County. Sun Oil Co.'s State-Cherry Grove A-1, SW SW SW 27-21n-10w, Cherry Grove Township, swabbed 25 barrels from Traverse lime, Devonian 3135-3142 feet, TD 3998.

MICHIGAN—OIL FIELD EXTENSIONS

Allegan County, Trowbridge field. Ford Henry's Van Ness 1, SW NW SE 23-1n-13w, pumped 12 barrels oil and 75 barrels water from Traverse lime, Devonian 1397-1398 feet, TD 1398.

Trowbridge field. Sheldon-Stewart Co.'s

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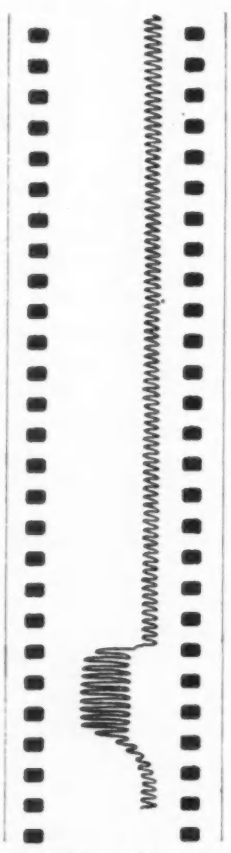

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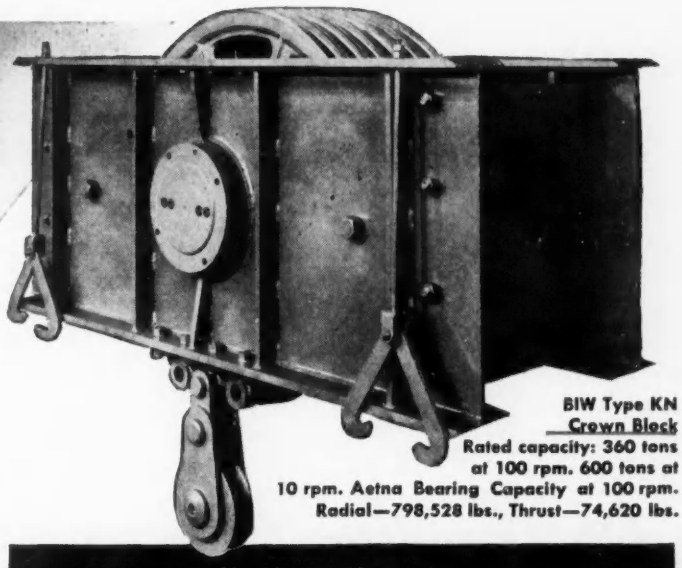

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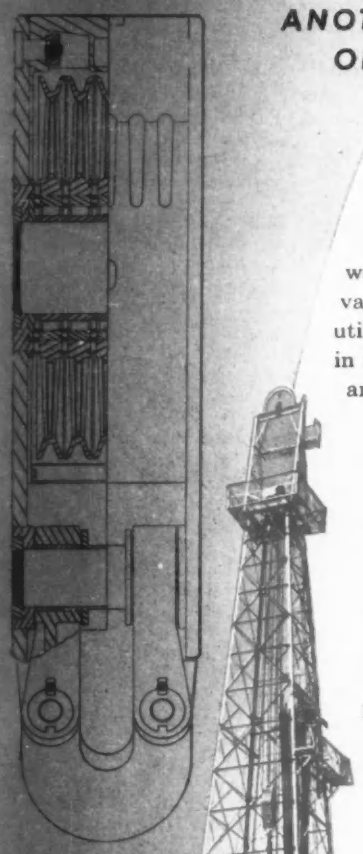

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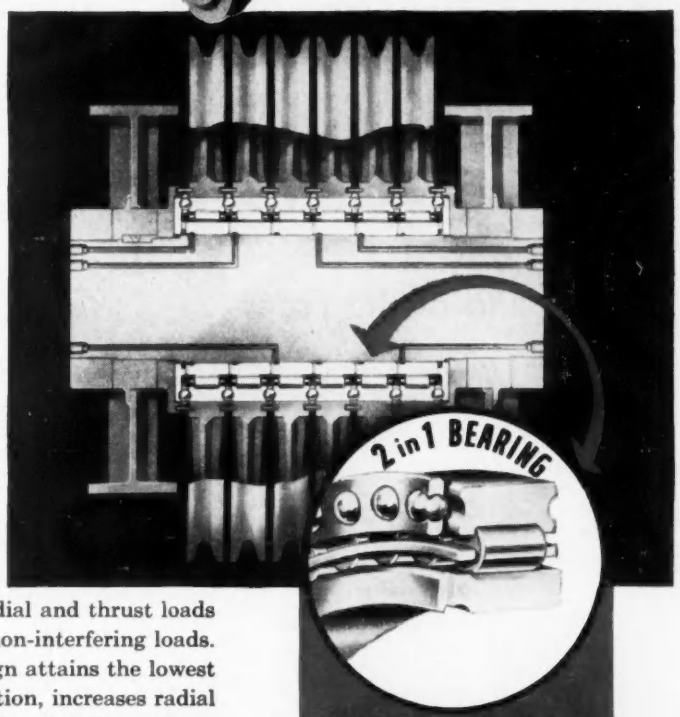

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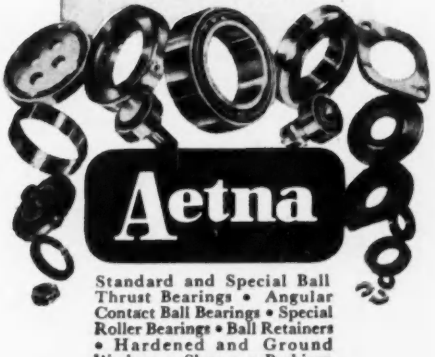

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Pickett 1, NE SE SW 5-1n-13w, Trowbridge Township, pumped 8 barrels oil and 2 barrels water from Traverse lime, Devonian 1346-1347 feet, TD 1360.

MICHIGAN—NEW GAS FIELD

St. Clair County, New Baltimore field. Panhandle Eastern Pipe Line Co.'s Ringel 1, C SE 31-4n-15e, Casco Township, flowed 14.6 million from Basal Salina Dolomite, Silurian 2496-2535 feet, TD 2763.

MICHIGAN—NEW GAS PAY

Mecosta County, Bevans Lake field. McClure Oil Co. & Swan-King Oil Co.'s Larson 1, NW SW NE 13-16n-10w, Green Township, flowed 3.5 million from Stray sand, Mississippian 1244-1259 feet, TD 2944.

MISSISSIPPI—NEW OIL FIELD

Adams County, Vernon field. Dave Gammill & Lyle Cashion Co.'s S. L. Winston 1, in 45-8n-2w, flowed 98 barrels from McKittrick sand, Eocene 5809-5810 feet, 11/64 inch, 44-gravity, completed 7-15-52, TD 6720.

MONTANA—NEW OIL FIELD

Rosebud County. The Texas Co.'s E. L. Grebe 1, C NW NW 15-11n-32e, flowed 283 barrels from Amsden lime, Mississippian 4719-4732 feet, 34.4-gravity, completed 7-17-52, TD 4912.

NEW MEXICO—NEW OIL FIELDS

Lea County. Fullerton Oil Co.'s Elliott-Federal 4, in 9-21s-38e, pumped 41 barrels from San Andres lime, Permian 4342-4382 feet, 2½ inch, 35-gravity, completed 6-18-52, TD 4382.

Unnamed field. Horsting Oil Co.'s Phillips-State 1, in 20-17s-33e, pumped 43 barrels from Grayburg sand, Permian 4414-4424 feet, completed 7-31-52, TD 4765.

Unnamed field. Phillips Chemical Co.'s State 1, in 4-15s-32e, pumped 36 barrels oil and 93 barrels water from Lower Wolfcamp, Permian 9730-9740 feet, 40-gravity, completed 7-10-52, TD 10,000.

OHIO—OIL FIELD EXTENSIONS

Coshocton County, Mt. Vernon field. Preston Oil Co.'s Ethel Reese 1, Section 11, New Castle Township, 2-mile east extension, swabbed 77 barrels from Clinton sand, Silurian 3341-3380 feet, completed 7-31-52, TD 3393.

Knox County, Mt. Vernon field. I. C. Robinson's Allen Taylor 1, Section 20, Clay Township, flowed 92 barrels from Clinton sand, Silurian 2704-2734 feet, completed 7-22-52, TD 2773.

OKLAHOMA—NEW OIL FIELDS

Kay County, Newkirk, East field. Helmerich & Payne Inc.'s Seltzer 1, NW NE NE 15-28n-3e, flowed 6 barrels oil and 15 barrels water from Bartlesville sand, Pennsylvanian 3089-3101 feet, TD 3101.

Unnamed field. Orville H. Parker's Rollins 1, SE NE SE 22-29n-1e, pumped 15 barrels oil and 19 barrels water from Peru sand, Pennsylvanian 3140-3144 feet, TD 3552.

Logan County. Sam Trant & John Kraker's Wilson 1, NE SE NW 26-17n-1e, flowed 720 barrels from Second Wilcox sand, Ordovician 5136-5147 feet, ½ inch, 42.3-gravity, TD 5147.

Noble County, Perry, Southwest field. H. E. R. Drilling Co.'s Strom 1, NW NW SE 8-20n-1w, flowed 50 barrels from Perry sand, Pennsylvanian 3500-3511 feet, TD 3511.

Osage County, Doga, Southwest field. A. G. Oliphant's Osage 1, CN½ SW SW 13-24n-4e, pumped 20 barrels from Mississippi Chat, Mississippian 3338-3355 feet, TD 3355.

Hominy Lake, South field. T. F. Dukes' Osage 1, NE NE NE 8-22n-8e, flowed 100 barrels from Hominy sand, Ordovician 2860-2901 feet, 1/16 inch, 40.4-gravity, completed 7-52, TD 2901.

Payne County. Mohawk Drilling Co.'s Ralph Johnson 1, NW NW SW 6-18n-2e, flowed 144 barrels from Viola lime, Ordovician 4912-4942 feet, ¼ inch, TD 5019.

OKLAHOMA—NEW OIL PAYS

Carter County, Camp field. Daubes Oil Co.'s Colbert 3, SE NW SW 7-2s-3w, flowed 556 barrels from Goodwin sand, Pennsylvanian 6020-6024 feet, 31-gravity, TD 6188.

Lincoln County, Sporn, Southwest field. W. C. McBride, Inc.'s Viola Harris 1, SW SE SW 31-17n-3e, pumped 49 barrels oil and 48 barrels water from Red Fork sand, Pennsylvanian 4573-4577 feet, TD 4854.

Noble County, Gansel field. Helmerich & Payne's Wagner 1, NW NW SE, 23-21n-2w, pumped 80 barrels from Avant lime, Pennsylvanian 3500-3514 feet, 42-gravity, completed 7-52, TD 3515.

Perry, Northwest field. Schermerhorn Oil Co.'s Vertz 2, NW SE SE 7-21n-1w, pumped 20 barrels from Reagan sand, Pennsylvanian 1982-1994 feet, 39 gravity, TD 3435.

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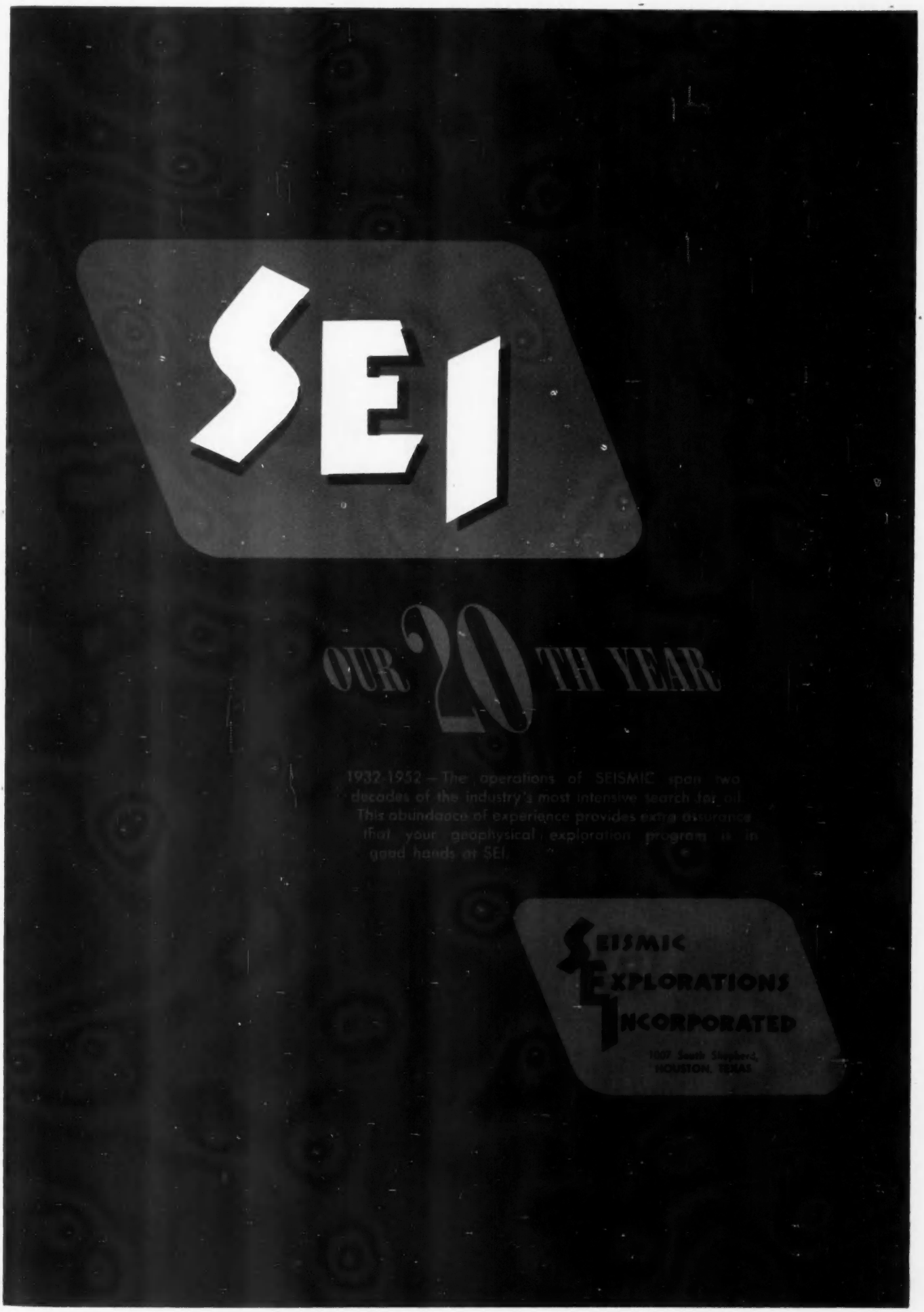
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OKLAHOMA—OIL FIELD EXTENSION

Osage County, Naval Reserve field. George Pease, Jr.'s Osage 1, NE NE NW 6-24n-7e, northwest extension, pumped 25 barrels oil and 12 barrels water from Burbank sand, Pennsylvanian 2637-2683 feet, TD 2683.

OKLAHOMA—NEW DISTILLATE FIELD

Payne County, Gano, South field. H. Waggoner Drilling Co.'s Carter 1, NW SE SE 27-18n-5e, flowed 50 barrels distillate and 3.5 million from Misener sand, Mississippian 3758-3765 feet, 45 gravity, TD 3774.

TEXAS DISTRICT 1—NEW OIL FIELD

Atascosa County. Sid Katz's C. T. Troell 1, F. M. Manfield Survey 6, pumped 73 barrels from Carrizo sand, Eocene 1897-1899 feet, 17.7-gravity, completed 7-24-52, TD 1899.

TEXAS DISTRICT 2—NEW OIL FIELDS

Karnes County. Jake L. Hamon's Luling Oil & Gas Co. 1, L. Navaretto Survey, flowed 8 barrels from Luling sand, Lower Cretaceous 7057-7059 feet, ¼-inch, 40-gravity, completed 5-1-52, TD 7360.

Live Oak County, Ramirina area. Humble Oil & Refining Co.'s Mary A. Reynolds 1, G. W. Sharp Survey, flowed 123 barrels from 4544-4550 feet, ⅛-inch, 50.2-gravity, completed 7-30-52, TD 6003.

Unnamed field. V. G. Schimmel's C. W. Christensen 3, Antonio Fernandez Survey 18, flowed 32 barrels from Pettus sand, Eocene 3646-3652 feet, ¼-inch, 35.2-gravity, completed 7-3-52, TD 4015.

TEXAS DISTRICT 2—NEW DISTILLATE FIELDS

Calhoun County. Western Natural Gas Co.'s State Tract 55-1, in San Antonio Bay, flowed 291 barrels distillate and 11.5 million from Frio sand, Oligocene 8872-8884 feet, open, completed 6-26-52, TD 11,584.

Jackson County. Production Service Oil Corp.'s John W. Young Estate 1, W. J. E. Heard Survey, flowed 73 barrels distillate and 32 million from Frio sand, Oligocene 5424-5434 feet, open, completed 6-12-52, TD 6500.

TEXAS DISTRICT 2—GAS FIELD EXTENSION

Jackson County, Collier field. John L. Robinson's Steffek & DeWitt Unit 1, John Andrews Survey, east extension, flowed 96 million from Miocene sand 2238-2248 feet, open, completed 7-4-52, TD 3002.

TEXAS DISTRICT 3—NEW OIL FIELDS

Brazoria County. The Texas Co.'s Solon L. Reeves, et al 1, Stephen F. Austin Survey 8, flowed 42 barrels from Frio sand, Oligocene 10,102-10,112 and 10,126-10,136 feet, 10/64-inch, 50.4-gravity, completed 6-28-52, TD 11,858.

Hardin County, Pine Ridge field. Chance Drilling Co.'s Nona Mills 1, Block 6, I. D. Hamilton Survey, Old Well Worked Over, flowed 85 barrels from Yegua sand, Eocene 9533-9539 feet, 8/64-inch, 37.8-gravity, completed 7-26-52, TD 9653.

Harris County, Fairbanks, South field. Production Maintenance Co., et al's J. C. Juhn 1, Joseph Bays Survey, Section 25, Block D, flowed 79 barrels from Cockfield sand, Eocene 7019-7046 feet, 3/8-inch, 33.0-gravity, completed 7-6-52, TD 7907.

Matagorda County. Magnolia Petroleum Co.'s Ethel Cornelius 3, J. C. Peyton Survey, flowed 62 barrels from Frio sand, Oligocene 9073-9076 feet, 10/64-inch, 37.9-gravity, completed 7-13-52, TD 12,010.

TEXAS DISTRICT 3—NEW OIL PAYS

Galveston County, Caplen field. Sun Oil Co.'s State Tract 27-3, Section 27, ½-mile fr production, flowed 308 barrels from Miocene sand, Miocene 7555-7559 feet, 36-inch, 35.9-gravity, completed 7-27-52, TD 7800.

Harris County, Fairbanks, South field. Petrex Oil Corp.'s Oldham Unit 1, Joseph Bays Survey, flowed 110 barrels from Look sand, Eocene 7218-7221 feet, 10/64-inch, 35.4-gravity, completed 7-26-52, TD 7270.

Fairbanks field. Sinclair Oil & Gas Co.'s W. W. Goody Koontz 5, Wiley S. Powell Survey, flowed 97 barrels from Upper Goody Koontz (Yegua) sand, Eocene 7175-7183 feet, ¼-inch, 34.7-gravity, completed 7-19-52, TD 7554.

TEXAS DISTRICT 3—NEW DISTILLATE FIELD

Fort Bend County, Blue Ridge, North field. J. R. Butler, et al's John L. Barnes

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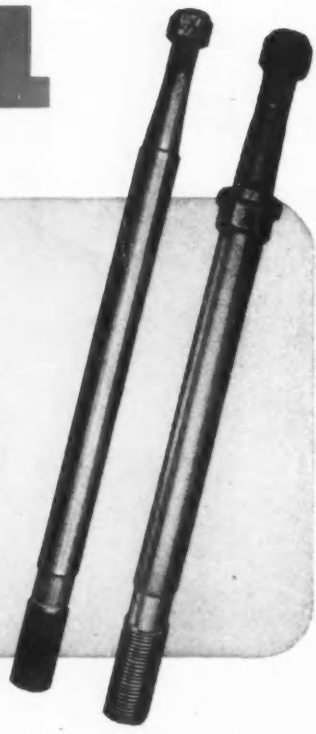

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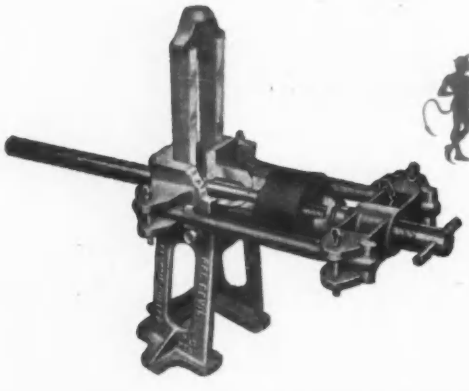

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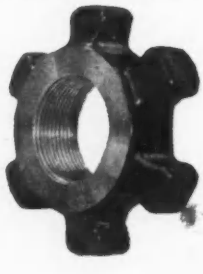

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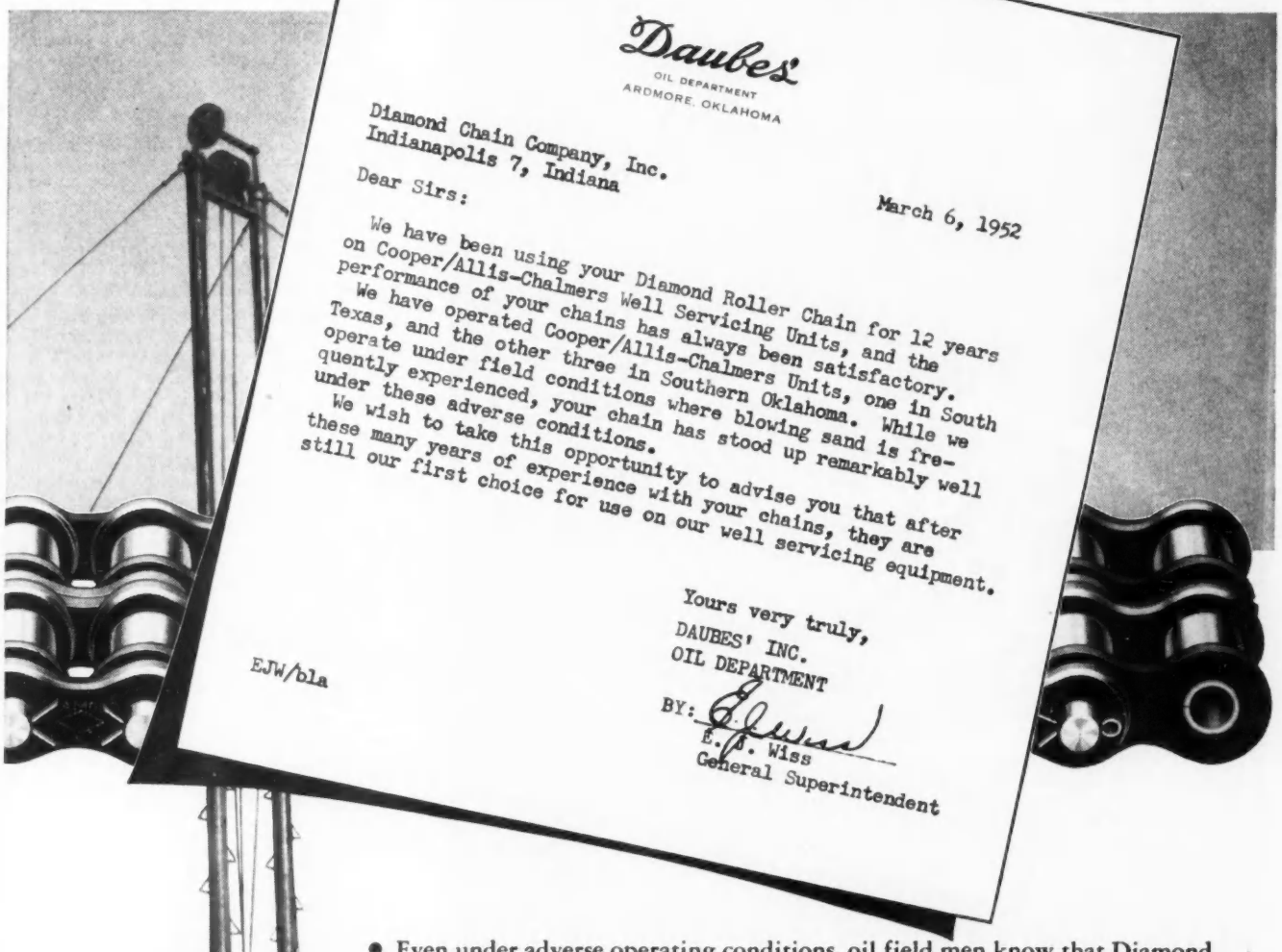

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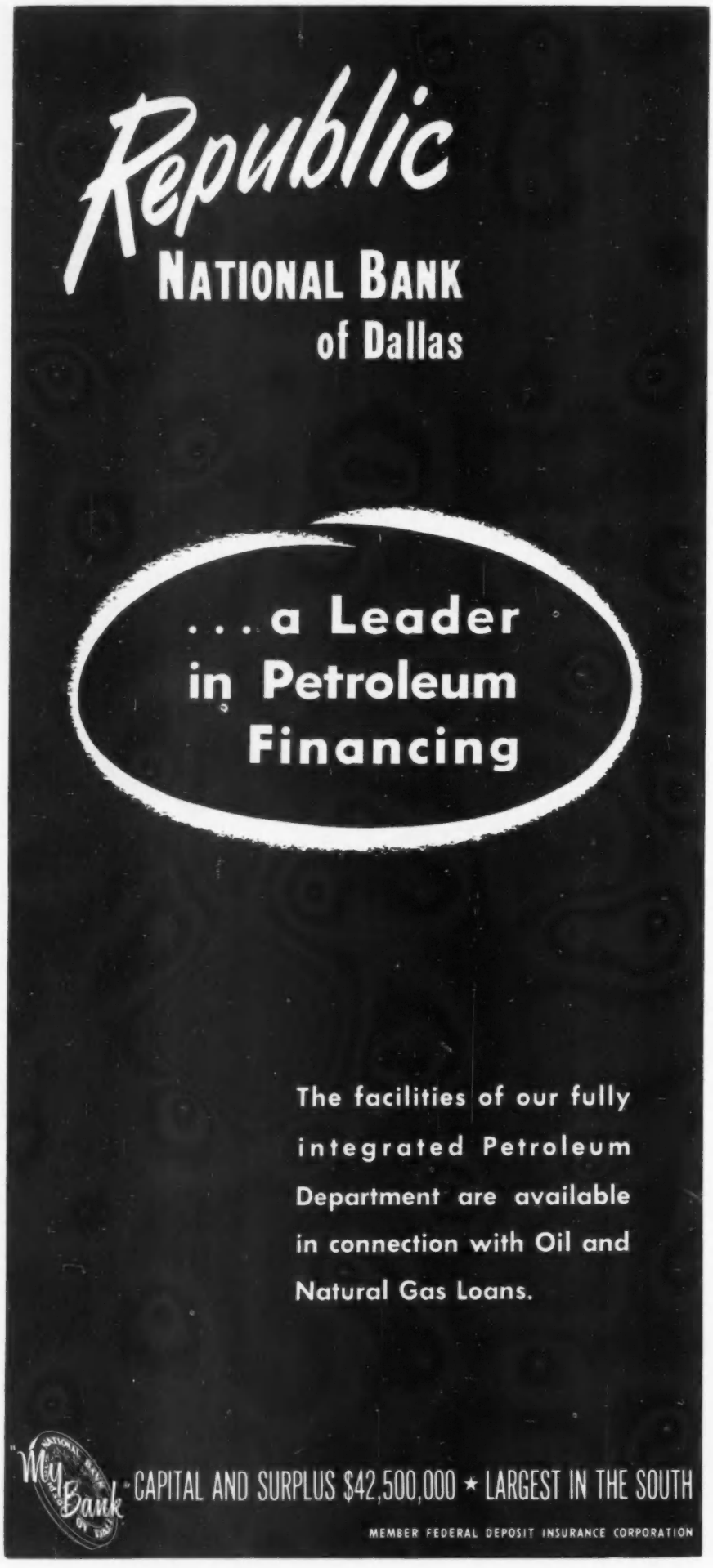
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1, I&GN RR Co. Survey, flowed 629 barrels distillate and 18 million from Vicksburg sand, Oligocene 8417-8427 feet, open, 56-gravity, completed 7-9-52, TD 8460.

TEXAS DISTRICT 3—NEW GAS FIELD

Newton County, Hartburg, Northwest field. Houston Oil Co. & American Republic Corp.'s Preston Edward Lindsey, et al 1, C. Champion Survey, flowed 33 million from 7443-7445 feet, open, completed 6-27-52, TD 8075.

TEXAS DISTRICT 4—NEW OIL FIELDS

Aransas County, Fulton Beach, East field. A. O. Phillips' L. M. Sanders et al 1, Wm. M. Carper Survey, Outlot 6, Fulton Townsite, flowed 36 million from Frio B-2 sand, Oligocene 7118-7128 feet, open, and flowed 161 barrels from Frio B-Y sand, Oligocene 7176-7198 feet, completed 5-26-52, TD 8514.

Duval County. Sam Cunningham's Karl Mann 1, Lot 1, Section 18, Realitos Subdivision, Capita Farm & Gardens Tracts, flowed 77 barrels from Yegua sand, Eocene 4251-4256 feet, ⅛-inch, 41.2-gravity, completed 7-21-52, TD 5263.

Hidalgo County. Houston Oil Co. of Texas and American Republics Corp.'s Temple W. West et al 2, flowed 173 barrels from Frio sand, Oligocene 6204-6214 feet, 10/64-inch, 48.7-gravity, completed 7-24-52, TD 6758.

Nueces County. Renwar Oil Corp.'s Clara Hearn 1, D. Martinez Survey 420, flowed 86 barrels from Douglas sand, Oligocene 5882-5883 feet, 7/64-inch, 40.9-gravity, completed 7-3-52, TD 7218.

San Patricio County. Republic Natural Gas Co. & Union Oil of California's J. A. Ewing G-1, George H. Paul Subdivision of Coleman Fulton Pasture Co., Lands, Section 12, Block 6, flowed 152 barrels from Frio sand, Oligocene 6893-6897 feet, ⅛-inch, 40.4-gravity, completed 7-16-52, TD 8979.

TEXAS DISTRICT 4—NEW OIL PAYS

Aransas County, Lamar field. Sun Oil Co.'s Aransas State Tract 66-2, in Aransas Bay State Tract 66, flowed 175 barrels from Frio sand, Oligocene 7292-7314 feet, 9/64-inch, 38.4-gravity, completed 7-12-52, TD 7326.

Nueces County, Turkey Creek field. Renwar Oil Corp.'s Charles McKinzie 12, D. Martinez Survey 420, Old Well Worked Over, from Douglas sand, Oligocene 5900 feet, completed 7-52, TD 5900.

TEXAS DISTRICT 4—NEW DISTILLATE FIELDS

Aransas County, Blind Pass field. Richard & Bass' State of Texas 265-1, Aransas Bay State Tract 265, flowed 36 barrels distillate and 2.8 million from Frio sand, Oligocene 7998-8010 feet, 11/64-inch, 52-gravity, completed 7-21-52, TD 11,890.

Hidalgo County, Shary field. L. M. Lockhart, Shary Estate 1, Rio Grande Development Co. Subdivision of Melado Portion of San Salvador del tule Grant, Block 31, Lot 7, flowed 48 barrels distillate and 4.7 million from Vicksburg sand, Oligocene 8172-8198 feet, ¼-inch, 56.4-gravity, completed 7-30-52, TD 5667.

Unnamed field. Union Producing Co.'s C. H. Swallow 1, Lino Cavazos Survey, Beamer Subdivision, Block 88, flowed

105 barrels distillate and 19 million from Vicksburg sand, Oligocene 8248-8268 feet, completed 6-23-52, TD 11,286.

TEXAS DISTRICT 4—NEW DISTILLATE PAY

Nueces County, Daugherty field. Curtis Singleton Drilling Co.'s J. C. Bluntzer Estate 1, Bluntzer Partition, Block 6, flowed 144 barrels distillate and 9 million from Frio sand, Oligocene 4675-4691 feet, open, 66-gravity, completed 4-1-52, TD 6002.

TEXAS DISTRICT 4—NEW GAS FIELDS

Aransas County. Hunt Oil Co.'s State-Copano Bay 1-38, State Tract 38, Capano Bay, flowed 50 barrels distillate and 2.5 million from Frio sand, Oligocene 7115-7120 feet, 3/16-inch, completed 6-20-52, TD 10,005.

Kenedy County. La Gloria Corp. et al's Kenedy Ranch A-2, Rincon del Penascal Grant, flowed 21 million from Frio sand, Oligocene 7287-7308 feet, open, completed 6-23-52, TD 7543.

Unnamed field. The Pure Oil Co.'s State Tract 285-1, Laguna Madre Tract 285, flowed 9.4 million from Frio sand, Oligocene 9463-9470 feet, open, completed 7-7-52, TD 11,850.

San Patricio County. Daubert & Achning's A. Soehnge 1, MPJ&N Delgado Grant, Block 11, Schleicher and Joseph Subdivision, ungauged from Frio sand, Oligocene 4024-4028 feet, completed 4-8-52, TD 4803.

TEXAS DISTRICT 6—NEW GAS FIELD

Cherokee County. Texas Eastern Production Co.'s J. W. Summers Estate 1, J. M. Muszuez Survey, flowed 1.3 million from Woodbine sand, Upper Cretaceous 4421-4424 feet, open, completed 7-12-52, TD 8923.

TEXAS DISTRICT 7C—NEW OIL FIELDS

Crockett County. Deep Rock Oil Corp.'s J. M. Shannon Estate 1, J. Wiley Heirs Survey 2, pumped 136 barrels from Wolfcamp lime, Permian 5866-5872 feet, 34-gravity, completed 7-2-52, TD 6461.

Unnamed field. Yeatman Drilling Co.'s H. L. Bair 1, Section 51, Block 1, I&GN Survey, pumped 41 barrels from Yates sand, Permian 1394-1411 feet, 30.4-gravity, completed 7-17-52, TD 1411.

Runnels County. E. K. & E. M. Burt & Edgar Davis' Robert Spill 1, J. C. McKean Survey 534, flowed 322 barrels from Caddo lime, Pennsylvanian 4388-4396 feet, ½-inch, 46-gravity, completed 7-29-52, TD 4477.

Unnamed field. Geocemical Surveys' J. A. Traylor 1, J. S. Moore Survey 360, pumped 65 barrels from King sand, Pennsylvanian 2260-2262 feet, 42-gravity, completed 7-19-52, TD 2500.

Unnamed field. Gilchrist Drilling Co.'s Donnie Mae Bomar 1, Section 49, GH&H Survey, flowed 65 barrels from 3406-3410 feet, ½-inch, 42-gravity, completed 7-21-52, TD 3460.

Tom Green County. L. E. Scherk & Argo Oil Corp.'s Tom Nasworthy 1, H. Zervack Survey 178, pumped 75 barrels from Lower Pennsylvanian lime 5916-5926 feet, 34-gravity, completed 7-31-52, TD 6406.

Unnamed field. Stanolind Oil & Gas Co.'s J. W. Johnson 1-C, George Smith Survey 1813, pumped 22 barrels from

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Glenrose conglomerate 27-53 feet, 25.5 gravity, completed 7-15-52, TD 150.

TEXAS DISTRICT 7C—OIL FIELD EXTENSIONS

Reagan County, Aldwell-Spraberry field. BBM Drilling Co.'s L. C. Proctor 1-4, Section 4, Block C, LS&V Survey, north extension, Old Well Drilled Deeper, flowed 143 barrels from Spraberry sand, Permian 7762-7780 feet, 38-gravity, completed 7-10-52, TD 7800.

Pembrook, North field. Murphy Corp.'s J. F. Nunn 1, Section 3, Block B, LS&V Survey, ½-mile southwest extension, flowed 571 barrels from Spraberry sand, Permian 6535 feet, ½-inch, 40.2-gravity, completed 7-6-52, TD 6644.

TEXAS DISTRICT 8—NEW OIL FIELDS

Crane County. Shell Oil Co.'s John Edwards et al 2, Section 18, Block B-17, PSL Survey, pumped 43 barrels from Lower Clearfork lime, Permian 4840-4989 feet, 36.4-gravity, completed 6-6-52, TD 7774.

Glasscock County. Seaboard Oil Co. of Delaware & T&P Coal & Oil Co.'s S. J. Bishop 1, Section 31, Block 32, T&P Survey, flowed 413 barrels from Wichita Albany lime, Permian 6130-6162 feet, 24/64-inch, 39.1-gravity, completed 7-7-52, TD 6211.

Kent County. Chapman and McFarlin Production Co.'s D. M. Cogdell Jr. 1, Section 775, Block 97, H&TC Survey, flowed 286 barrels from Lower Pennsylvanian sand 4538-4600 feet, ½-inch, 38.6-gravity, completed 7-27-52, TD 7633.

Midland County. Anflo Oil Co.'s R. S. Davenport 1, Section 46, Block 37, T&P Survey, flowed 424 barrels from Upper Spraberry sand, Permian 6995-7200 feet, 38-gravity, completed 3-16-52, TD 7209.

Scurry County, Winfield (Ellenburger) field. Superior Oil Co. & Intex Oil Corp.'s R. J. Jordon et al 13-578, Block 97, Section 578, H&TC Survey, flowed 162 barrels from Ellenburger dolomite, Ordovician 8360-8370 feet, 8/64-inch, 42.1-gravity, completed 7-7-52, TD 8370.

Sterling County. Tex Harvey Employees Corp.'s Jessie Elwood Chappell 1, Section 43, Block 18, SPRR Survey, flowed 99 barrels from Mississippian Detrital sand, 7674-7684 feet, 24/64-inch, 46.5-gravity, completed 7-31-52, TD 7761.

Terry County. Jake L. Hamon et al's Atlas Life 1, Section 93, Block D-11, C&M Survey, pumped 308 barrels from Wolfcamp lime, Permian 8304-8336 feet, 28.5-gravity, completed 7-27-52, TD 13,245.

Winkler County. Stanolind Oil and Gas Co.'s S. B. Wight 1-B, Section 25, Block 40, PSL Survey, flowed 112 barrels from Ellenburger dolomite, Ordovician 11,517-11,596 feet, 9/64-inch, 43-gravity, completed 7-6-52, TD 11,596.

TEXAS DISTRICT 8—NEW OIL PAYS

Borden County, Borden-Ellenburger field. Sinclair Oil and Gas Co.'s Sterling Williams 1, Section 45, Block 32, EL&RR Survey, Old Well Drilled Deeper, pumped 98 barrels from Mississippi lime, Mississippian 9815-9868 feet, 39.9-gravity, completed 7-26-52, TD 10,035.

Gaines County, Hobbs, East field. Humble Oil & Refining Co.'s E. B. Bailey et al 4, Section 6, Block A-10, PSL Survey, flowed 107 barrels from 4455-4459 feet, ¼-inch, 33-gravity, completed 4-5-52, TD 4459.

Howard County, Vincent, East field. Coronet Oil Co.'s Brokhage 1, Section 4, Block 25, H&TC Survey, flowed 380 barrels from Glorieta lime, Permian 2893-2898 feet, ½-inch, 19.9-gravity, completed 7-31-52, TD 7769.

TEXAS DISTRICT 8—OIL FIELD EXTENSIONS

Glasscock County, Driver-Spraberry field. American Republics Corp.'s Buckner Orphans Home 1, Section 17, Block 35, T&P Survey, 1¾-mile northeast extension, flowed 281 barrels from Spraberry sand, Permian 7880-8005 feet, 20/64-inch, 39.6-gravity, completed 7-23-52, TD 8050.

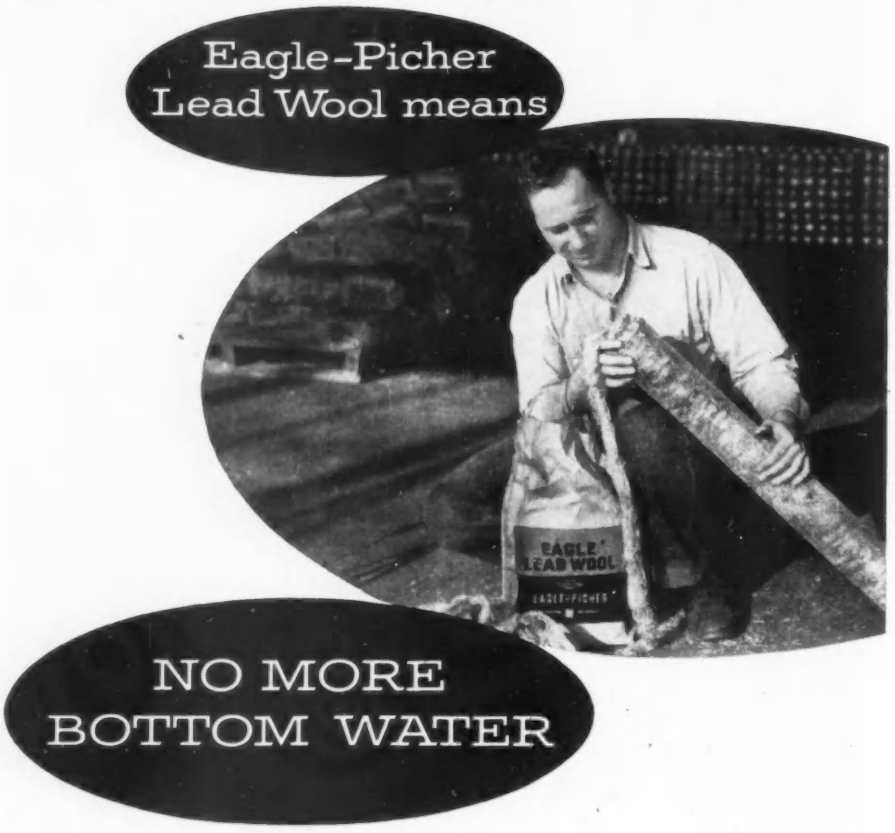
Yoakum County, Wasson field. Alma McCutchin's Pearl Dillard 1, Section 637, Block D, John W. Gibson Survey, ½-mile north extension, pumped 23 barrels from San Andres lime, Permian 5238-5319 feet, 32-gravity, completed 6-21-52, TD 5319.

TEXAS DISTRICT 8—NEW GAS FIELD

Sterling County. Phillips Petroleum Co.'s Libb 1-A, Section 52, Block 14, TW&NG Survey, flowed 13 million from Wolfcamp lime, Permian 3976-4000 feet, completed 7-18-52, TD 5489.

TEXAS DISTRICT 8—GAS FIELD EXTENSION

Crane County. Cabot Carbon Co.'s State of Texas 3, Section 26, Block 1, H&TC Survey, flowed 3.8 million from Tubb sand, Permian 5403-5440 feet, completed 7-14-52, TD 5916.



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The association of technical men with drilling has been limited . . . now the contractor needs to expand program . . . progress of the industry is at stake

Unlike pioneer drilling tools, present-day rig cannot be operated with a pair of pliers and spool of bailing wire. Machinery has become complicated and specialized. Engineered streamlining is essential to decent operating economy.

Drilling Industry—A New Frontier for the Engineer

By A. W. THOMPSON

President, Thompson-Carr, Inc., Houston

President, American Association of Oilwell Drilling Contractors

TODAY, the contractor is completing at least 91 percent of all wells drilled for the petroleum industry. With this heavy responsibility resting upon his shoulders, it is the contractor's obligation not only to do a job in the best possible manner but, looking to the future, to improve the work as he goes along.

Oil operators, whether they be majors or independents, are depending largely upon technical personnel for improved and economical operations. Engineers, following strenuous training programs, are being promoted to supervisory positions. The oil producing company is realizing and justifying the talent of engineering personnel coupled with the knowledge of the experienced, practical employe.

There is no need to discuss the many benefits which the oil producer is reaping from the technical-practical team. Producing methods have been vastly improved since this plan was inaugurated not too many years back. But in the meantime the drilling contractor, who has been assigned a greater task in the industry, has not kept abreast with the industry's progress simply because of the difficulty in attracting technically trained personnel into their organization.

Adding to the problem's complexity, a majority of the oil producing companies have disposed of their drilling rigs. Thus technical personnel with these companies have no on-the-job training where they can become familiar with practical methods of drilling. This situation, coupled with a void of engineering personnel within the contractor's organization, adds to the fact that today the industry is not training an adequate number of drilling engineers.

Situation Critical

All branches of the petroleum industry — except drilling — are being given close technical attention. Petroleum engineering has become a complex structure with specialists in reservoir, equipment, secondary recovery, proration, etc. Needless to say, the refinery and gasoline plants plus pipe line companies have heavy, but profitable, investments in engineering talent. However, the drilling contractors and oil producing companies operating rigs have depended little upon technical personnel.

The situation is critical. Some stopgap measure must be considered or, in time, the drilling branch of the industry will not be in a position to keep pace with rapid strides made by other branches operating with the practical-technical partnership.

Producing companies are doing a commendable job in training petroleum engineers. But the average petroleum engineer with a majority of the operators is not really familiar with drilling operations. And, with this condition present, there is really

no common meeting ground for the tool pusher and the company engineer on the derrick floor.

The problem is abstract to many contractors since few have had the opportunity to observe the gratifying results produced by the practical-technical team. But, it must be remembered that many operators invest 75 percent of their budget toward drilling projects, operations which today are given minimum engineering attention.

What the Producer Is Doing

Some producing companies, not equipped with rigs, are now farming out trainee engineers to drilling contractors. In this manner, the young engineer becomes an employe of the contractor and learns drilling operations and practices. This plan is in its infancy and is being followed by a minority of the operators; however, it does demonstrate the recognition of a need for intensified drilling training for technical personnel.

A few major companies left with drilling tools assign their engineers to rigs for a training program. As there are few of these rig-operating companies left, only a small number of engineers are given the needed engineering training. It then becomes necessary for the producing company to depend more and more upon the drilling contractor to provide training grounds for their young engineers.

Manufacturer Has Helped

Today, a heavy part of the equipment design load falls upon the manufacturer and service company. Rig designs, in a majority of cases, are laid out by the manufacturer's technical representative since very few contractors have personnel qualified to do justice to the job engineering-wise. These engineers have done a commendable job in rig designs; however, their training and lack of time does not permit them to assist the contractor in carrying out improved drilling practice programs.

The drilling industry is deeply indebted to the manufacturer and service companies for these services. Their work has been well done but the fact remains that drilling is becoming such a complicated operation that there is a dire need for engineering personnel within the contractor's organization.

What Can the Contractor Do?

The contractor, by assuming the responsibility for drilling over 91 percent of last year's wells, is obligated to the industry to improve drilling techniques and operations. To accomplish this, it is necessary to depend more and more upon the practical-technical team. Unfortunately, few contract organizations have this complete combination available.

The young engineer has gone to the major company since the attraction has been greater. Representatives of these companies make a special effort to contact the engineer, prior to graduation, and explain the future offered by the oil producing company. To my knowledge, few drilling contractors have followed this practice, the net result being that the producing company is well engineered while the contractor, a very important segment of the industry, is all but stripped of engineers.

To keep abreast of industrial progress, the aggressive drilling contractor must make a more serious attempt to secure and train technical personnel to form the practical-technical team so essential to excellerated progress in the business of drilling wells. Granted, engineers are now in great demand; however, the farsighted contractor can explain to the young engineer the many advantages available to him within the drilling industry.

The engineer, in some instance, will be promoted through the organization from crewman to driller, toolpusher or superintendent. Or after basic drilling training, the engineer will fill the important practical-technical team requirements by devoting time to studies of better operation methods and improved maintenance practices. Records show that concerted effort of the practical-technical team toward such simple practices as rig lubrication, wire line care and drill pipe maintenance will pay dividends to the drilling contractor.

How Will He Pay His Way?

The contractor cannot depend upon the manufacturer's engineer to do everything. When a new rig is requisitioned, it is the responsibility of the manufacturer's technical personnel to assist in ironing out any rig-up or operating problems. However, even the number of manufacturer's field engineers is quite limited. Thus, for the general improvement of the drilling industry, the contractors must seek out and train their own technical personnel.

The practical-technical team can accomplish unlimited ends for the drilling contractor. Operational and maintenance problems can be given the engineer's full attention and, under the guidance of the operating man, overhead falling within these categories can be slashed surprisingly.

The present day rig does not approach perfection. It has been improved through the years, thanks to the manufacturer. But in general, equipment continues to become heavier and more bundlesome. Here is one phase of the business where the technical-practical team will assist the contractor, producing company and also the manufacturer by designing lighter, more flexible equipment capable of completing an assigned job.

Rig unitization is an important role to be played by this working team. How many contractors have all of their rigs assembled in a standard manner? Just a few. Hence, it can be said that one of the most important phases of drilling contracting is being overlooked.

The practical-technical team will be in a position to study and improve rig-up practice to cut down moving time. Drilling practice can be improved through study and consideration.

The above are just a few of the many problems which can be tackled by this combination. The possibilities are unlimited and the contractor will be benefited financially while his method of operation will continually seek a higher level.

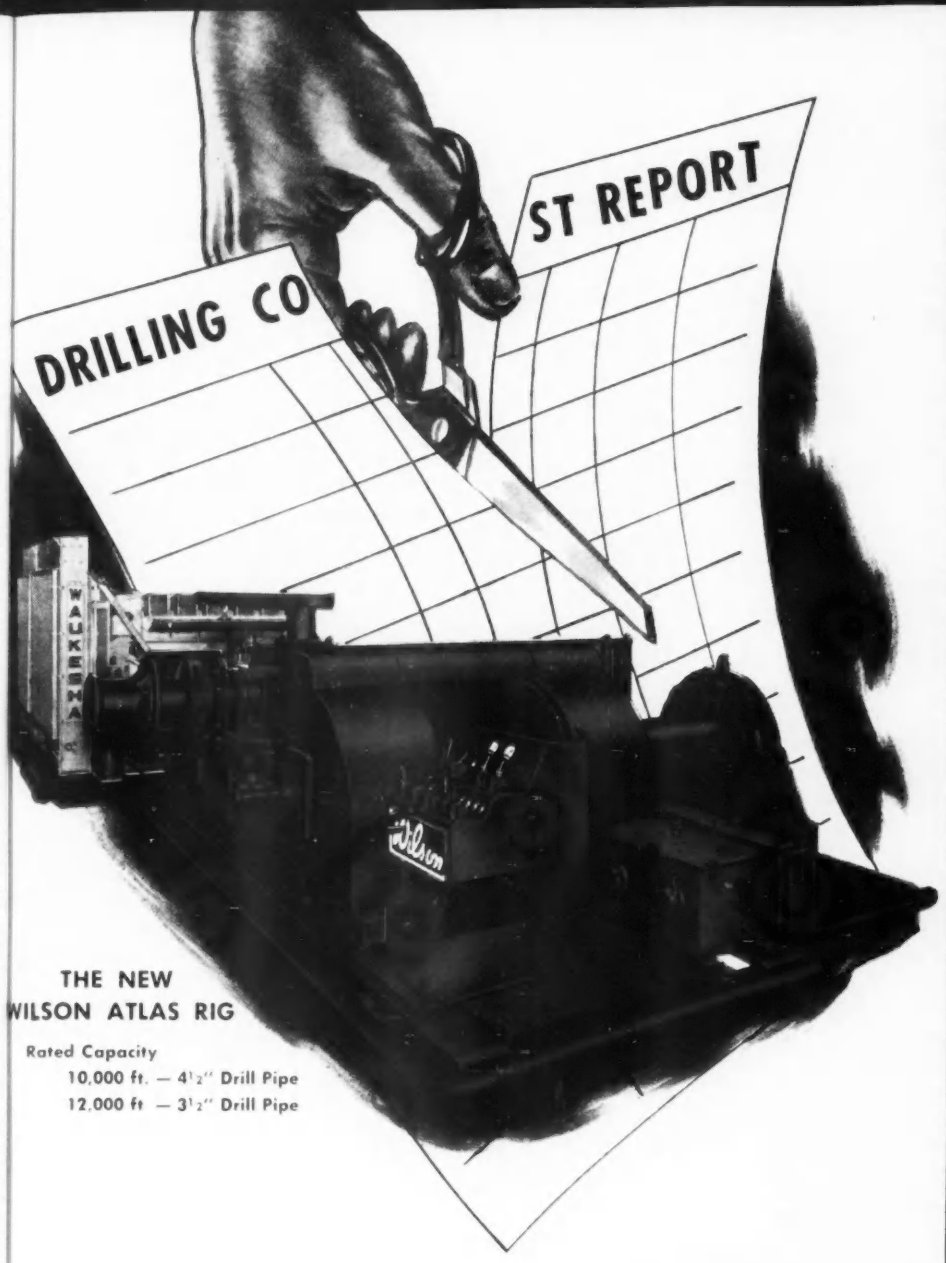
The idea, although new to the drilling contractor, is not new in other branches of the industry. The farsighted, aggressive contractor is already accepting and applying the plan. And at this time, it can be said that the drilling contractor of the future must accept the plan to remain on a competitive level with other operators.

Service to Industry

The benefits from this plan are not wholly restricted to the drilling contractor. The industry's increasing confidence in him is reflected by the heavier load which they are placing upon his shoulders. It is indeed a compliment to the drilling contractor that so much of the well drilling responsibility has been assigned to him and his organization.

He cannot, however, accept this responsibility and just say "thank you." This challenge must be met by the development of a more efficient organization, the secret of which is the practical-technical partnership.

The contractor's pursuance of this plan will help him to streamline and increase the efficiency of his organization. And improvements which he makes in this method of operation are relayed directly to the producing company and finally the entire industry. It is a responsibility facing the con-



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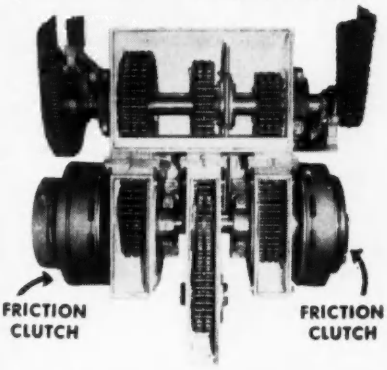

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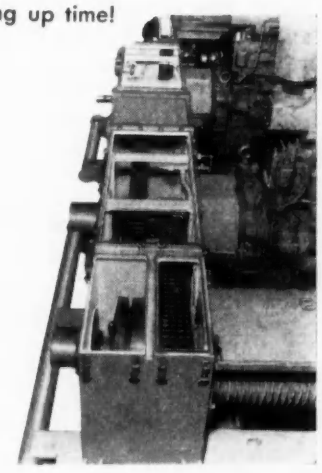

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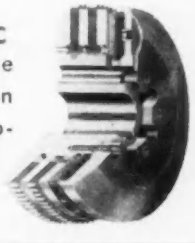

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ABOVE. The field-trained engineer can offer an important service to drilling contractor. Here, checking tool joint thread drift, engineer is performing one of many chores essential to efficient and economical equipment maintenance.

RIGHT. Aside from equipment unitization, maintenance and drilling practice improvement programs, engineer will offer valuable assistance in drilling mud control. One of heaviest investments in drilling operations, mud is in need of increased engineering supervision. By technical consultation and crew training, the engineer will save operator many thousands of dollars.

tractor—whether he likes it or not. Evidence of the program's success, can now be seen in some of the contractor organizations which adopted the practical-technical partnership years back. Although few have accepted and applied the principle, those that have can show gratifying results. They are the contractors who exert little effort in the process of keeping their rigs running.

Right this minute some drilling contractors are planning a long range training program for engineering personnel. Some contractors even are assisting outstanding employes of college age to complete a degree in engineering.

It has been suggested that a plan be arranged with some college whereby the high school graduate attends engineering school for a six month period and then returns to the rig for another six months. During the training process, this individual would always be just one of the hands. This process of training would take somewhat longer but the final product would be a well trained technical man who understands not only the engineering but basic principles of drilling. The lack of such men is a current problem as it is difficult for engineers who have not worked on rigs to have this knowledge.

These training programs are not turning out "desk engineers," as this type of individual is of little use to the drilling contractor. The men following the training program, when graduated as a finished product, think as engineers but perform as practical hands.

Plan Profitable to Contractor

Although it has been mentioned previously that the engineer's role in drilling is important — actually indispensible—the drilling industry is in a position to repay the engineer interesting dividends. The program, with select personnel, is infallible. There have been and there will be mistakes in launching this type program. Some engineers will remain with the contractor until the time his training is completed, then seek employment elsewhere.

The road for the successful drilling engineer is not easy. But through frugal application with some certain personal sacrifices, the engineer will experience benefits seldom seen in other phases of industry. In the process, the contractor is forming a more efficient, flexible and profitable organization. It is in the cards for the contractor to accept this plan. It must be adopted, strengthened and expanded if the contractor intends to move at the rapid pace set by other branches of the petroleum industry.

There is no earthly doubt that this plan has worked successfully in petroleum production. Even so, 15 years back the operating production man would not predict the day of the technical-practical partnership. Now the same remark is being made by members of the drilling fraternity. This is, in one sense of the word, merely a confession that maybe the drilling industry is neither as aggressive nor as interested in organizational improvement as was the producing company.

The producer has reaped great benefits from the plan. By the same token, the drilling contractor will experience a comparable, if not greater profit from the plan since the drilling rig, unlike production equipment is constantly on the move, subject to great overhead, and is in need of programs driving toward streamlining and improved efficiency.

It is an obligation which is owed the industry for the added responsibility it has thrown upon the drilling fraternity. In short, the very existence of the drilling contractor, as an industry or as an individual organization, depends upon long range planning toward a more concentrated formation of the practical-technical team.

Mechanics of Cable Tool Drilling

Here's An Analysis of Dynamometer Data, Optimum Wire Line Performance, Other Laws Conducive to Improved Operation

By KENNETH N. MILLS

Mechanical Products Manager, IDECO Division,
Dresser Equipment Company, Columbus, Ohio

THE cable tool process has been used to drill wells for centuries. Since its inception, the equipment used to produce the drilling motion has been constantly improved. However, the basic principles have not changed and will not change, because they are evolved around basic mechanical laws.

As this process uses the principle of percussion (chipping) to produce the drilling action, it is well suited to drilling extremely hard formations, and for this reason it enjoys wide popularity in "hard rock" country. The rates of penetration attained are dependent on the skill of the driller and the basic design of the drilling machine. The drilling practices are based on practical experience, and in general they represent good practice for the equipment used to drill the well. Since practical experience is involved, widely divergent opinions on the optimum values of stroke length, drilling speed and desirable types of surface motion can be obtained from cable tool drillers. Some of these opinions represent good practical evaluations of the theoretical mechanics of the cable tool drilling system, while others are in conflict with all the theoretical mechanics of the process. As a general rule, the drilling practices which follow rules set out by a theoretical analysis of the system produce the maximum drilling rates.

Basically, the cable tool drilling process is a problem in vibration mechanics. The vibratory system consists of the drilling line and the tools attached to the lower end of the drilling line. In this system the drilling line acts like a spring, and the tools constitute a mass attached to the free end of the spring. This system is represented diagrammatically in Figure 1. The action of this system can be visualized by attaching a weight to the end of a rubber band and holding the other end of the band. If the hand is stationary, the weight attached to its free end will be stationary. If the hand is reciprocated, the weight will reciprocate. The distance traveled by the weight in comparison to the distance traveled by the hand will depend on the frequency of reciprocation of the hand. At low rates of reciprocation the travel of the weight will be equal to the travel of the hand. As the rate of reciprocation of the hand is increased, the distance traveled by the weight as compared to the travel of the hand will increase. This relative increase in the travel of the weight will increase until a critical rate of reciprocation is reached, after which an increased rate of reciprocation will cause a decrease in the relative motion of the weight. When the system was reciprocated at the rate which produced the maximum travel of the weight, the motion of the hand was in resonance with the natural frequency of the vibrating system. Under these conditions the distance traveled by the weight will become infinite if energy is not removed from the system by friction or work being done by the weight.

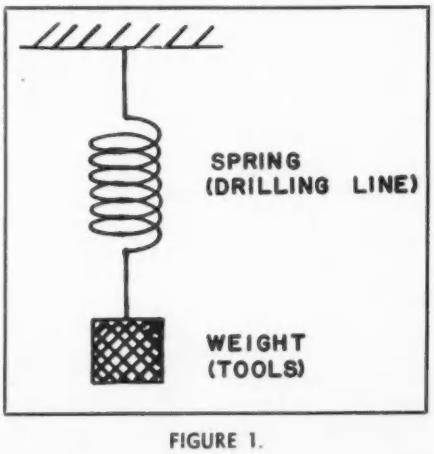

FIGURE 1.

In the cable tool drilling system, the reciprocating motion is imported to the drilling line and tools (the vibratory system) by the drilling machine. The rate of reciprocation imparted to the drilling line by the drilling machine partially controls the distance traveled by the drilling tools. The distance traveled by the drilling tools increases as the frequency of drilling motion approaches the natural frequency of the drilling system. The distance traveled by the tools will never become infinite, because energy is lost through friction between the drilling line and the hole, and the tools are dissipating energy on the formation being drilled. The energy dissipated by the tools produces the drilling action, and it will be shown later that the amount of energy delivered to formation by the tools is dependent on drilling practice and is controllable. The engine used to drive the drilling machine must supply the energy required to overcome the friction losses and perform work on the formation being drilled.

The use of steel drilling lines has produced some changes in drilling practices, and it has dictated some major changes in the design of the drilling machine. To assure maximum drilling energy of the tools, the drilling cable must act like a spring. It must have sufficient elasticity to keep the natural frequency of the system within the speed limitations placed on the system by the ability of the tools to follow the surface motion. The usual steel drilling line has sufficient flexibility to achieve these aims at

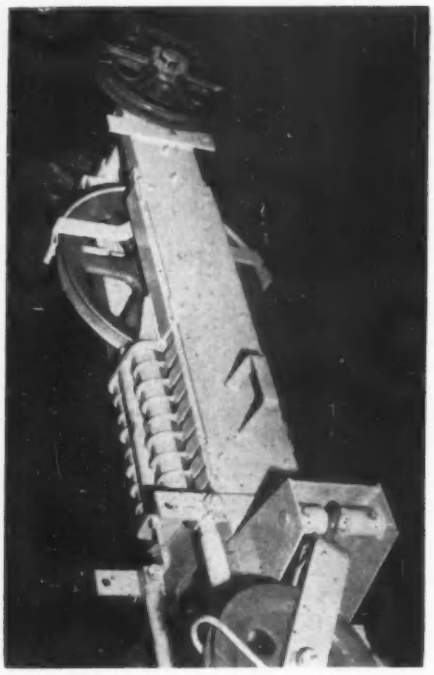

FIGURE 2.

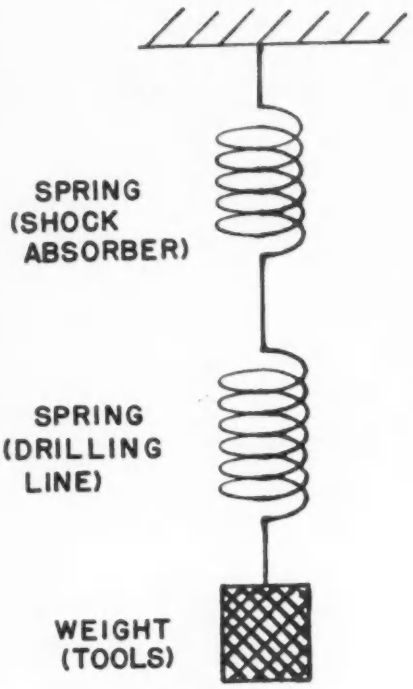

FIGURE 3.

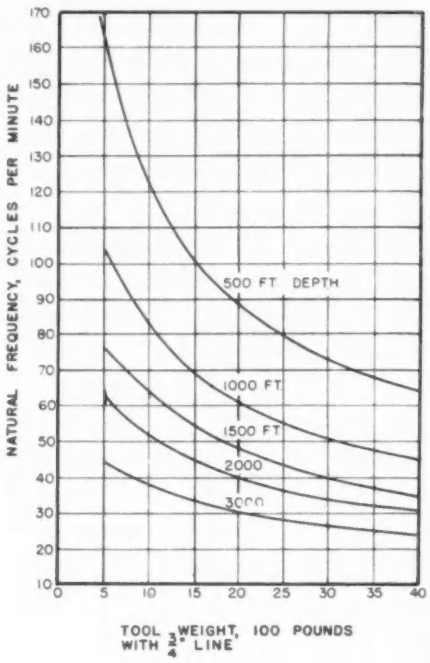

FIGURE 4.

moderate depths, but it is not sufficiently elastic to achieve them at very shallow depths. This difficulty has been overcome by adding elasticity to the system in the form of a rubber- or air-mounted shock absorber. In the case of modern spudders, this device is usually placed under the crown sheave which supports the drilling line. A typical shock absorber of this type is shown in Figure 2. When elasticity is added in this manner, spring effect of the shock absorber is added to that of the line, and the system can be represented diagrammatically as shown in Figure 3.

The natural frequency of the cable tool drilling system is expressed by the equation:

$$f = 54.3\sqrt{\frac{Ea}{LW}}$$

where:

f = Natural frequency, cycles per minute.
E = Modulus of elasticity of drilling line, approximately 13 million for a new line.
a = Metallic area of line, square inch.
W = Weight of tools plus ⅓ weight of drilling line.
L = Length of drilling line, feet.

The natural frequency of the cable tool drilling system with a shock absorber is expressed by the following equation:

$$f = 188\sqrt{\frac{KS}{W\,(K+S)}}$$

where:

K = Spring constant for drilling line.
S = Spring constant for shock absorber.

The relationship between natural frequency, tool weight and depth for ¾-, ⅞- and 1-inch drilling lines is shown in Figures 4, 5 and 6. These curves are based on a line with a modulus of elasticity of 13 million which corresponds to a new drilling line. As the line is used, it stretches, and its modulus of elasticity increases. The modulus of the line increases, because the major portion of the stretch is the result of the lines tending to unwind, and this decreases the helix angle of the strands of the line. If this condition was carried to its ultimate conclusion, the modulus of the line would be identical with that of the individual wires in the line, and the modulus of the line would be 30 million. This condition is never achieved in practice, and the modulus of a worn out drilling line is usually less than 22 million.

The vertical travel of the tools is dependent on the following factors:

- Length of surface stroke.
- Relationship between the surface drilling speed and the natural frequency of the system.
- Type of surface motion.
- Magnitude of friction losses in the hole.
- Amount of energy delivered to formation by the drilling tools.

The vertical travel of the tools is always greater than the length of the surface stroke. The magnitude of the difference between the surface stroke and the tool travel is dependent on the ratio of the forced frequency (surface drilling speed) to the natural frequency of the system. If the surface motion is assumed to be simple harmonic, and the tools are not performing useful work, the increase in tool stroke over the surface stroke can be predicted from the data shown in Figure 7. This family of curves shows the values of the magnification factor for various frequency ratios and degrees of damping or friction. For the assumed conditions, the tool stroke would be the surface stroke multiplied by the proper value of the magnification factor. Now, the basic assumptions that the surface motion is simple harmonic and that the tools are not performing useful work detract from the practical value of this family of curves. The surface motion on most cable tool drilling machines is not simple harmonic. The effect of this deviation from the assumed conditions is to distort the shape of this family of curves, and it does not eliminate the stroke multiplying effect.

The effect of the work performed by the tools on the formation is identical with that of friction as energy is removed from the system. Increasing the magnitude of the tool blow on the formation will increase the amount of energy removed from the system and will decrease the length of tool travel. Decreasing the magnitude of the tool blow will increase the effective length of tool stroke, because less energy is removed from the system.

From Figure 7 it is apparent that the maximum tool stroke will be produced when the frequency ratio is unity. As will be shown later, the energy available for drilling increases as the tool stroke is increased. This

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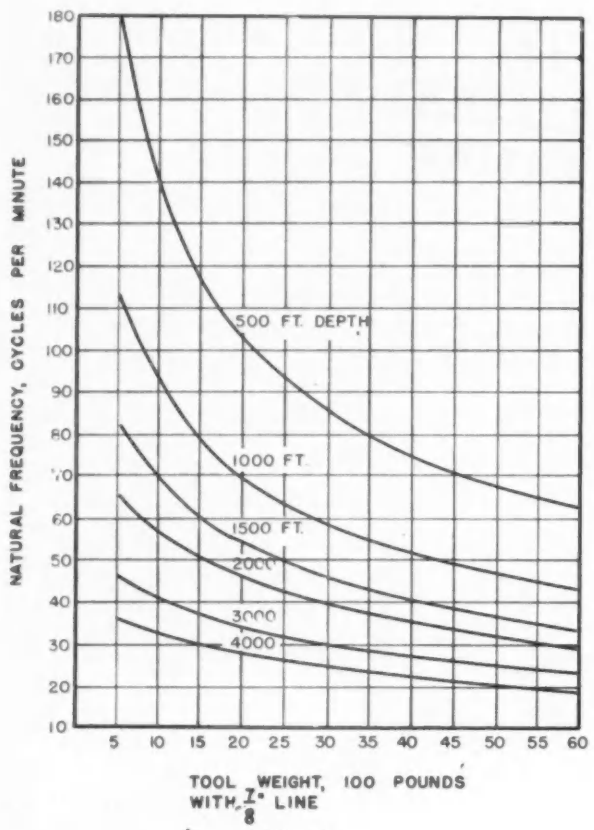


FIGURE 5.

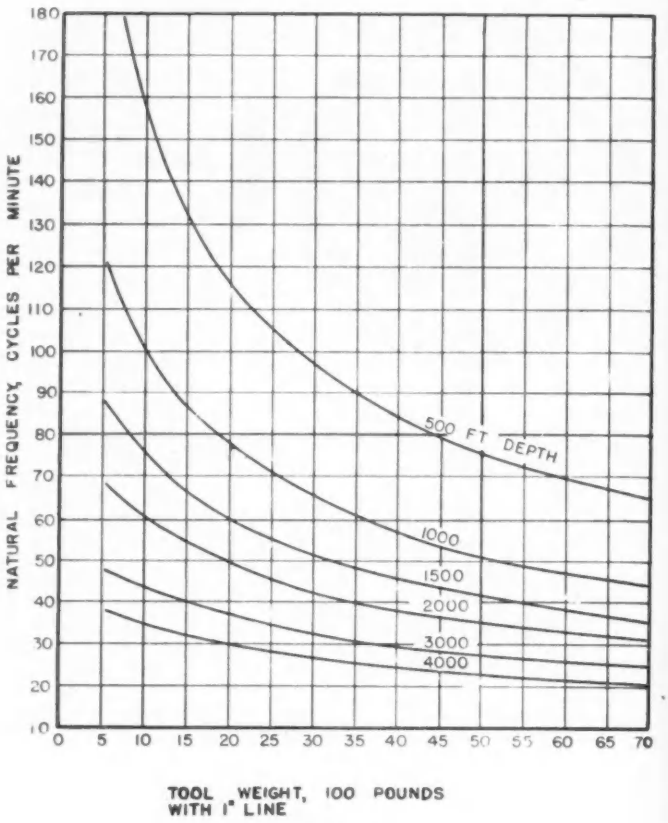


FIGURE 6.

would suggest that maximum rate of penetration should be attained when the system is operated near its natural frequency. Practical limitations, such as the ability of the tools to fall, the ability of the tools to absorb the energy of impact with the formation, and the ability of the drilling line and surface machinery to withstand the imposed loads may prevent operating at or near this desirable point.

If the tools do not follow the surface motion, a kink may be thrown into the drilling line and cause a premature line failure. The ability of the tools to follow the motion of the drilling machine is limited by gravity and the system must be operated at a speed which will not produce a rate of acceleration above that of gravity. Practical observation indicates that the probable maximum speeds are less than the maximums as defined in Figure 8. The exact value of the maximum speed will depend on the design of the drilling machine and the amount of friction loss in the hole. This graph is based on the following equation and does not consider the limits placed on the speed of the system by vibrations.

$$SPM = \sqrt{\frac{60{,}000}{L}}$$

where:

L = Length of stroke, inches.

As the actual tool travel is the result of mechanical vibrations, the state of the energy in the system can be analyzed to determine the amount of energy available for useful work. In any vibratory system which consists of a spring mounted mass, the energy in the mass is continuously changing from potential to kinetic. In the middle of its travel the mass has considerable kinetic energy, whereas in either of its extreme positions it stands still for a moment and has no kinetic energy. As only the kinetic energy can be directed to useful work, a study of this energy should give an indication of how the energy delivered to the formation can be controlled. The kinetic energy in the system can be expressed by the equation:

$$E = \frac{WV^2}{2g}$$

where:

E = Kinetic energy.
W = Weight of tools.
V = Velocity of tools.
g = Acceleration of gravity.

If the tools are assumed to be performing no useful work, the kinetic energy of the tools, i.e. energy available for drilling, varies with tool posi-

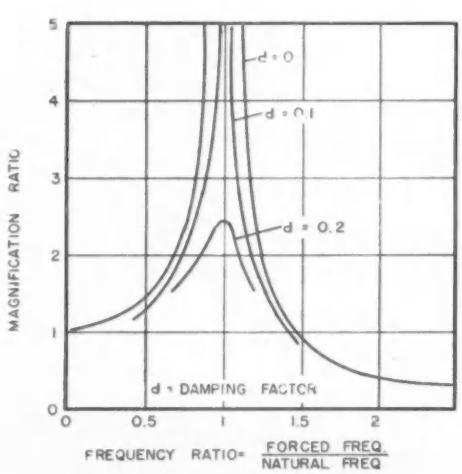


FIGURE 7.

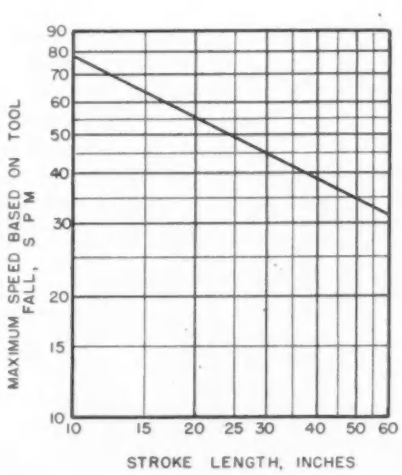


FIGURE 8.

tion as shown in Figure 9. In this illustration it will be noted that zero energy is available at the extreme ends of the tool stroke, and this energy increases as the tools proceed toward midstroke. The validity of this illustration can be visualized by assuming that the tool position is so adjusted that the tools just contact the formation at their extreme travel. Now, under these conditions they will not exert any force on the formation, and no useful work will be performed. If a small amount of line is let out, the tools will contact the formation and do useful work. As more line is let out, the energy imparted to the formation will increase. This process can be increased until the ability of the working face of the tool to do work is exceeded or the energy removal from the system exceeds the energy delivered to the system by the surface machinery. In very soft formations the tendency of the tools to stick may limit the permissible energy per blow.

The equation for the energy available in the tools indicates that for a constant hitch (static tool position) the energy available for drilling increases directly with tool weight and as the square of the tool velocity. The fact that it varies with the square of the velocity indicates that a long surface stroke and a high drilling speed are desirable when it is not possible to operate near the natural frequency of the system. As the maximum energy will be available when operating at the natural frequency of the system, operating at this point should produce the maximum drilling rates.

All loads produced by the vibrations of the drilling system must be carried by the drilling machine and line. These loads have been studied[1]

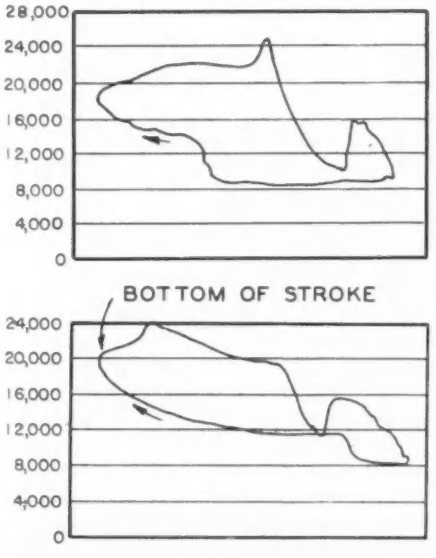


FIGURE 10.

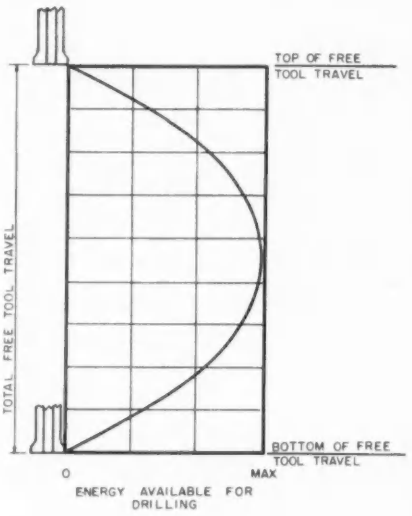


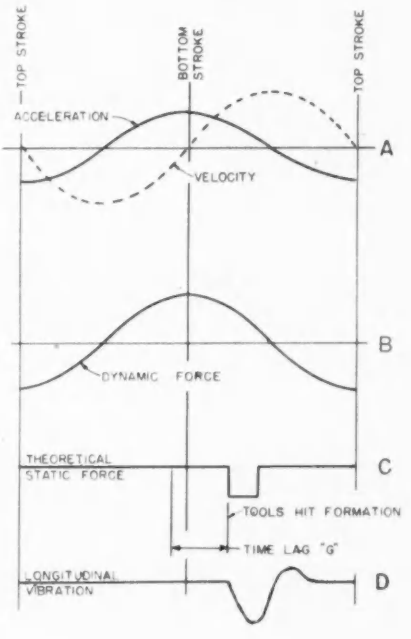
FIGURE 9.

with dynamometers of the type used to measure the polished rod load on pumping oil wells. Two dynamometer cards taken on a 6700-foot cable tool drilling well are shown in Figure 10. An analysis of the static and dynamic forces which combined to produce the surface loads as recorded by the dynamometer is shown in Figure 11. The curve marked A shows the ideal nature of the surface motion. The actual nature of the surface motion will depend on the geometry of the drilling rig and the amount of flywheel effect built into the rig. The approximate nature of the dynamic forces created by the surface motion are illustrated by the curve marked B. The curve marked C represents the static forces produced by the weight of the drilling line and tools. On this curve it will be noted that a lag exists between the time the tools hit the formation and the time this load reduction is recorded at the surface. This time lag represents the time required for this load reduction to travel the length of the drilling line. The magnitude of this time lag will increase as the depth of the well increases. This time lag can be evaluated by dividing the depth of the well by the rate of stress transmission in the drilling line. Curve D illustrates the dynamic effect of the sudden change in load resulting from the tools striking the formation. This sudden decrease in load induces a compressive wave into the drilling line which travels up the line at the rate of stress transmission in the line. When this compressive wave reaches the fixed end of the line it is reflected as a tensile wave which will be reflected from the free end of the line if the energy creating the stress wave is not dissipated through friction. In most cases it appears that the energy creating this wave is completely dissipated by friction before the second surface reflection. The intensity of the original compressive wave is dependent on the amount of energy released by the tools when they contact the formation, and its intensity increases as the amount of energy transferred from the tools to the formation increases. The intensity of this wave can be determined by grasping the drilling line and this principal is used by all cable tool drillers to determine the intensity of the tool blow on the formation.

All of these dynamic and static forces can be combined to evaluate the nature and magnitude of the resulting surface load. The results of this combination are shown as a resultant dynamometer card in Figure 10. When this theoretical dynamometer card is compared with the actual dynamometer cards it will be noted that their general shapes are quite similar. The principal difference is in the location of the load reduction created by the tools striking the formation. The location of this point will change as the well depth increases and the magnitude of the resulting load reduction will increase as the intensity of the tool blow increases.

REFERENCE

[1] "Measurement of Loads on Cable During Cable-Tool Drilling," G. S. Peterson, Feb., 1939.



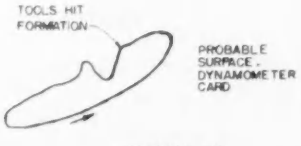
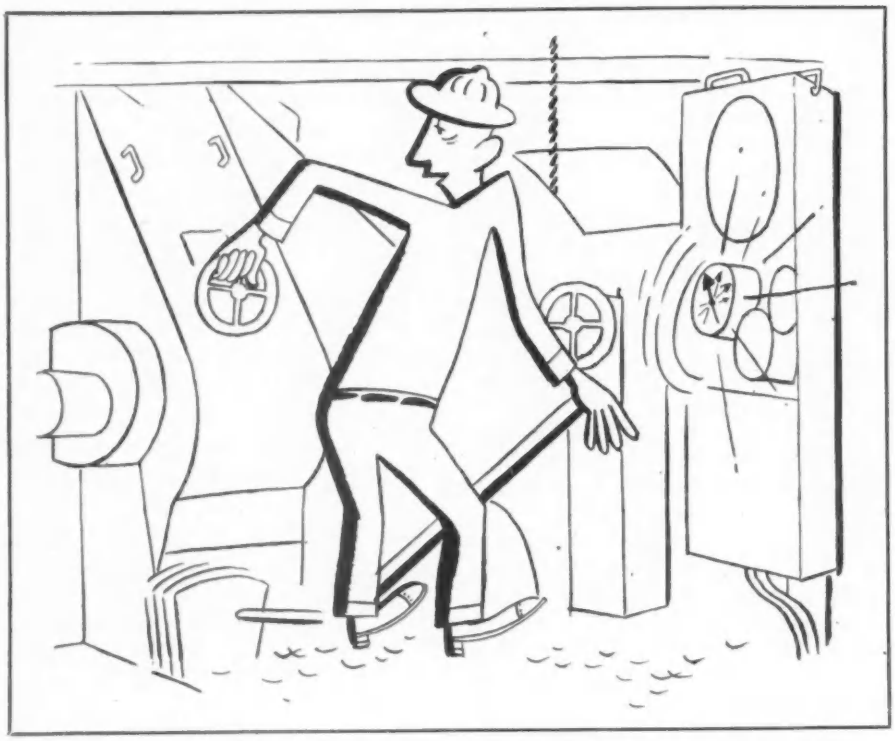


FIGURE 11.

Ten Rules For Rock Bit Care

Do not remove bit from box until it is ready for use. Serious damage can result when heavy objects strike pin threads.



Always wash back to bottom following a trip. If this precaution is not observed, bit can be momentarily plugged, thus skyrocketing mud pressure and poss.bly balling bit.

Carefully Followed, These Pointers Will Assure the Operator Extended Bit Life, Fewer Costly Trips

By JACK KNIGHT

Manager of Sales Development,
Reed Roller Bit Company,
Houston

MANY rock bits fail long before they have run their normal life. Most of these premature failures are caused by incorrect handling. Whether this is the result of lack of experience or haste, it costs drilling contractors millions of dollars every year.

This waste can be minimized if ten simple rules are followed by everyone concerned with handling or running rock bits.

- PROTECT BITS IN STORAGE. Keep bits in original boxes until used. Store boxes in a dry place protected from heavy equipment. This will avoid mechanical damage and rust. It will also aid in recording serial numbers.
- PLACE BIT IN BREAKER CAREFULLY to avoid breaking teeth or bending lugs. Also, use the correct breaker for the make and size of bit.
- TIGHTEN BITS SOLIDLY to prevent leaks or other troubles. Bits should be made up with approximately the same torque as drill collar connec-

CONTINUED ON PAGE 144

Automatic Drilling Comes of Age

Field Service Has Proven This Equipment Helps Personnel Relations, Eliminates Many Hazards and Saves Time

By MARTIN E. TRUE
Humble Oil & Refining Company
Houston

A GREAT amount of work has been done to increase the speed and efficiency of drilling operations and to reduce the fatigue of rig crews. As a result, automatic and semi-automatic-powered equipment is being used to perform more of the routine operations encountered in drilling wells. Air slips have found wide acceptance throughout the drilling industry and automatic drilling controls as well as air brakes are gaining favor. Now, after several years of research and field testing, equipment has been developed which permits making round trips with drill pipe with only the expenditure of the effort required for actuation of controls.

One complete set of the remotely-controlled, power-operated drill pipe tongs, spinner, stabber, pipe rackers, elevator and traveling block deflector is currently in field service. The latest design of this equipment is the outgrowth of the original set of the semi-automatic equipment field tested in the Gulf Coast area of Texas during 1948 and 1949. The original experimental semi-automatic equipment, described in a previous paper,[1] which was used for drilling approximately 75,000 feet of hole over a period of 18 months, was similar in many respects to the latest model and served as a basis for the final design.

Remotely-controlled, hydraulically-powered tongs suspended from a telescoping arm clamped to a derrick leg, perform the spinning and tonging operations and assist in stabbing the pipe. Single stands of pipe, before becoming a part of, or upon being removed from the string of pipe in the hole, are supported and positioned by semi-automatic-powered machinery, independent of the main hoisting equipment. This work is performed by an auxiliary hoist mounted near the

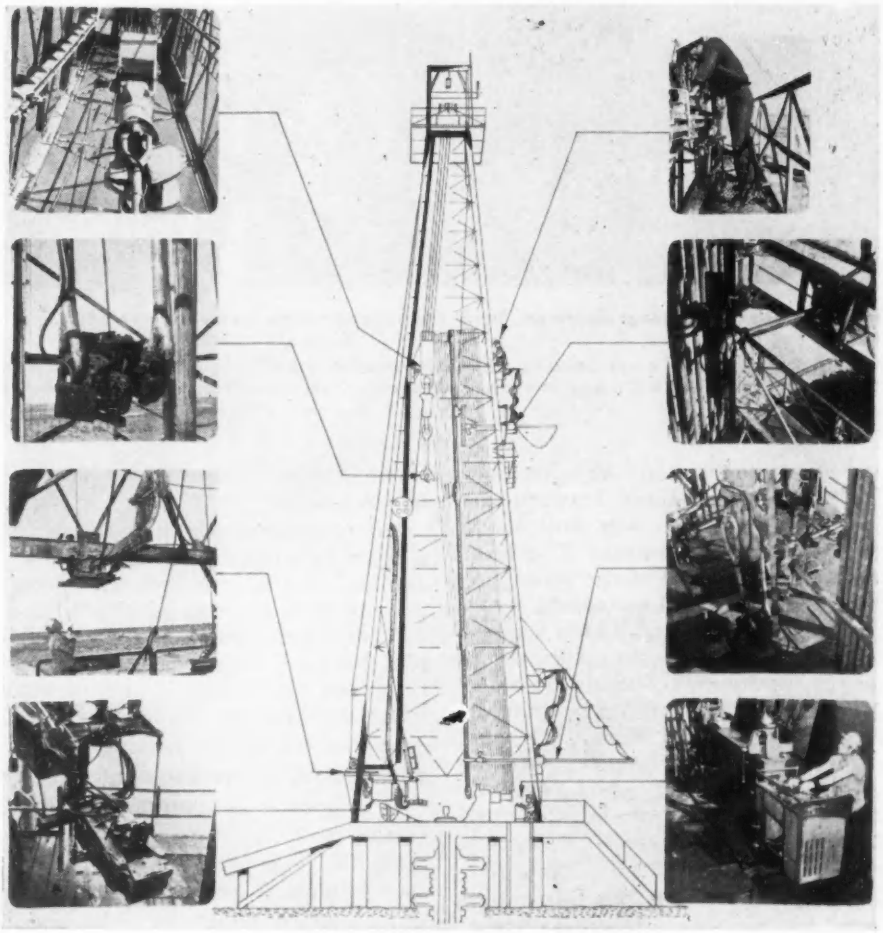


FIGURE 1. Semi-automatic, power-operated drilling rig.

About the Author

MARTIN E. TRUE is co-ordinator of equipment research in the Petroleum Engineering Division of Humble Oil & Refining Company. He is a member of the A.P.I. and A.I.M.E. True was born in New Mexico in 1911, and received the B. S. degree in mechanical engineering from Texas Technological College in 1938. He joined Humble immediately after graduation and shortly thereafter became associated with the Production Research Division where he served until 1945. Since then he has been engaged in equipment research.

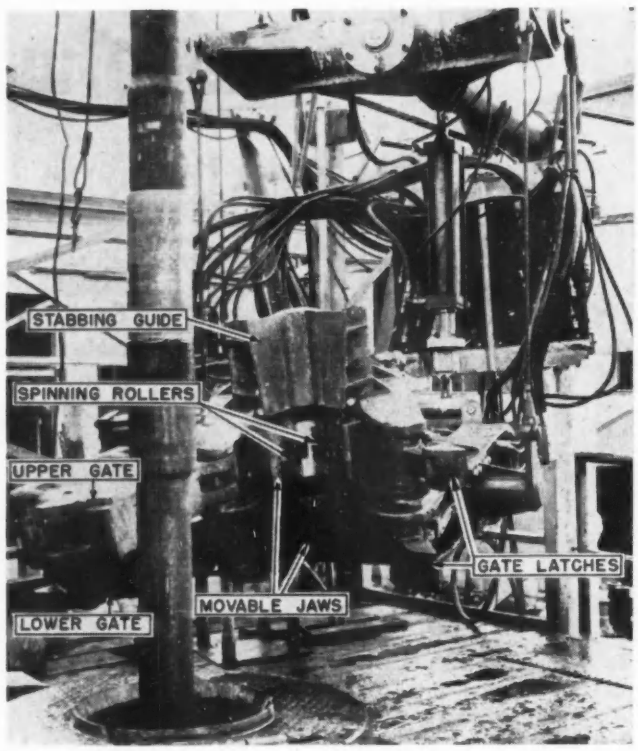


FIGURE 2 (left). Power tongs suspension. Tongs and valve panel are suspended from telescoping arm attached to leg of derrick. All movements of tongs are controlled remotely.

FIGURE 3 (right). Power tongs. Spinning rollers are extended hydraulically and driven by air motor. Pipe is gripped for tonging by dies on movable jaws which are also extended hydraulically. Tonging is accomplished by scissor action of upper and lower sections.

top of the derrick, and an upper and lower racker, mounted between the tenth and eleventh girts and above the first girt, respectively. The hoist supports the weight of the stand and provides for vertical movement, while mechanical arms and hands on the two rackers guide the pipe to its proper position. Opening the main pipe elevator is controlled by an operator on the derrick floor with compressed air, and closing is accomplished by a trigger which, on contacting pipe, holds the elevators open and springs compressed. To permit simultaneous movement of the traveling block and of the auxiliary equipment handling a single stand of pipe, a traveling block deflector has been provided; thus, the traveling block can make a trip up or down along the side of the derrick, without a load, while a stand of pipe in the center of the derrick is being made up or broken out, and idle time of all equipment is reduced appreciably.

Most of the physical effort in making round trips with drill pipe has been eliminated in that all operations of tonging, spinning, stabbing and racking of pipe on the floor are controlled by operators in a seated position by manipulation of hydraulic and pneumatic controls. The driller is relieved of operating the cathead, leaving only the hoist and slips to be controlled.

Safety is substantially improved, as a derrickman performs his duties by manipulating a single "joy stick" control on the working platform, and the conventional spinning chain and tong lines are removed from the derrick floor. The hazards and manual labor encountered in moving drill pipe to and from the racking position and in stabbing are also eliminated.

It is possible to maintain the high rate of handling pipe with this equipment for long periods where fatigue slows crews working conventionally during round trips, especially under adverse weather conditions. After completing round trips with this equipment, drilling crews are not exhausted; consequently, they are able to perform their duties effectively while drilling, which is essential for maximum overall efficiency. Figure 1 is a drawing of a derrick equipped with the power-operated drill pipe handling equipment.

Power Tongs. Hydraulically-operated power tongs are suspended from a telescoping arm clamped to the derrick leg, as shown in Figure 2. The arm is pivoted at the derrick leg to permit vertical, as well as horizontal, tong movement. Vertical movement is effected by a hydraulic cylinder, one end of which is attached to the tong end of the support arm, and the other end to a cable attached to the derrick leg at a height of 60 feet above the derrick floor. The tong movement to and from the center of the hole is accomplished by a hydraulic cylinder within the telescoping arm.

The tongs, shown in Figure 3, consist of two pipe gripping units, one mounted directly above the other. Make up or break out with the tongs is accomplished by a scissor action produced by a hydraulic cylinder connecting the outer ends of the tong frames. Figure 3 shows the tongs in the scissored position which is automatically assumed when they are set for making up tool joints. The tong frames are parallel to each other when set for breaking tool joints. Each tong is provided with a hydraulically-operated gate and latch, as shown in Figures 2 and 3, which are actuated by a control lever having a dual function on the remote control panel. The same lever controls the movement of the tongs to and from the center of the hole.

The jaws of the tongs, shown in Figure 3, are essentially "V" blocks containing dies. In order to effect the gripping force necessary to perform the tonging operation, they are moved

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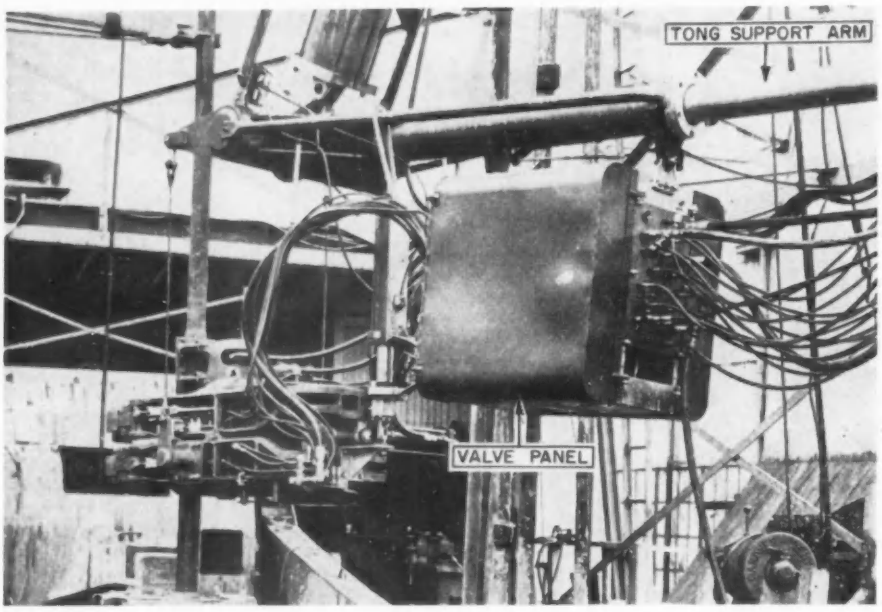


FIGURE 4. Valve panel for power tongs. Lines leading from rear of panel are hydraulic and air supply lines and pilot control lines extending to remote control panel.

with respect to the tong frames in the direction of the gate by hydraulic pressure applied to cylinders attached to the rear of the jaws. The upper tong is provided with a pair of serrated rollers which are extended beyond the face of the dies in the tong jaw by hydraulic pressure for engaging the pipe to produce the spinning operation. These rollers, which are six inches in diameter and capable of a speed of approximately 100 revolutions per minute, are powered by a 11-horsepower reversible air motor driving through reduction gears, sprockets, and roller chains. A third, smooth roller acts as an idler and is located in the gate of the upper tong. It, likewise, is extended hydraulically and holds the drill pipe tool joint clear of the gripping dies while spinning.

Final Tightening

After a tool joint has been shouldered by the spinner, the final tightening of the joint is accomplished by scissor action of the upper frame. The tongs are capable of gripping pipe ranging in size from 2⅞-inch tool joints (3¾-inch OD), up to and including 8-inch OD drill collars. Each of the tongs can exert a gripping force of approximately 400,000 pounds and can develop a maximum make up torque of 41,000 foot-pounds when the hydraulic system is operated at a pressure of 2500 pounds per square inch. The make up torque of the tongs is controlled to any predetermined value by regulating the hydraulic pressure entering the actuating cylinder which produces the relative motion of the tongs.

The various operations of the hydraulic tongs, spinner, and supporting arm are controlled by pneumatic and hydraulic valves in the panel mounted in back of the tongs and below the tong supporting arm, as shown in Figure 4. The lines leading from the rear of the panel are the hydraulic and air supply lines and the pilot control lines extending to the remote control panel, shown in Figure 5. This remote control panel is located at a convenient position on the edge of the derrick floor to allow the operator a full view of the various operations.

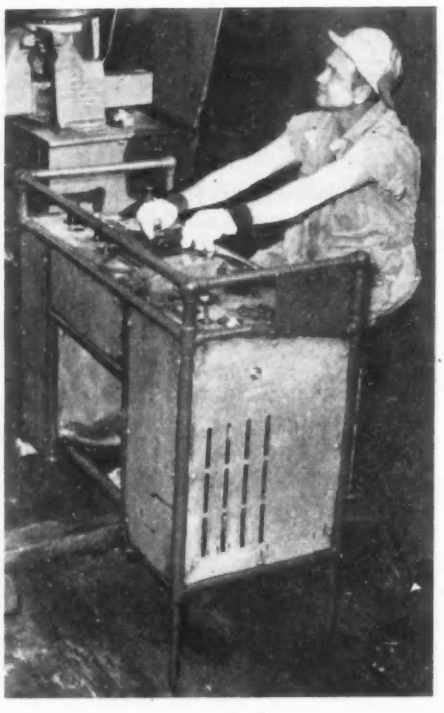


FIGURE 5. Remote control panel. From this panel operator controls all movement of tongs and lower racker and vertical movement of single-stand elevator. Air and hydraulic fluid are used as controlling media in pilot systems.

Remotely-Controlled Pipe Rackers. The pipe racking system consists essentially of two carriages, one mounted on horizontal tracks just above the first girt and the other on horizontal tracks between the tenth and eleventh girts, each of which supports a pneumatically-powered arm equipped with a mechanical hand. Each arm, which is constructed of three-inch diameter tubing, is capable of extending into the derrick a distance of approximately 18 feet. Two air motors mounted in each carriage drive the carriage and the arm through a mechanism similar to a rack and pinion. Two roller chains, one stretched parallel to the carriage tracks, and one fastened immediately below the arm, pass through each carriage. These chains are engaged by sprockets driven by the air motors, and thus each carriage can be moved along the side of the derrick on its tracks and each arm can be extended and retracted through its carriage. The roller chains for the upper racker may be seen in Figure 6.

Upper Racking Unit. The upper racking unit is shown in Figure 6. On the end of the racking arm is a vertical track which guides a single-stand elevator. This elevator consists of a "U"-shaped member capable of gripping and supporting a 90-foot stand of drill pipe. Vertical movement of the elevator and the lifting force required to support a stand of pipe are obtained by means of a pneumatic cylinder mounted just below the water table and connected to the elevator by a wire line. This power cylinder is controlled from the remote panel on the derrick floor. The elevator is equipped with a hydraulically-operated, spring-opening claw for supporting the pipe and with teeth on one side of the "U" for backing up the pipe while rotating out with the rotary table. A pullback system of cable and blocks for deflecting the single-stand elevator hoisting line is provided for producing an upward force on a stand of pipe to jump the pin out of the box as a joint is broken. Power for the pullback is supplied by an air cylinder mounted in the same assembly as the single-stand elevator hoist cylinder. Figure 6 shows the elevator at the top of the track im-

mediately after lifting a stand of pipe at the center of the derrick and carrying it to the racking position, and prior to lowering it to the pipe mat.

Conformation of the single-stand elevator to leaning pipe is provided for in one plane by a pivotal mounting of the track on the end of the arm and in the other plane by a hinge between the elevator and its carriage. Control of the upper racker for positioning the pipe is obtained through a single "joy stick" operated by the derrickman from either the platform outside the derrick, as shown in Figure 7, or from the conventional platform inside the derrick.

Handling Drill Collars

For handling drill collars, a heavy duty hook is provided immediately behind the single-stand elevator track, as shown in Figure 6. This hook is rotated into a horizontal position for handling collars and is equipped with rollers to facilitate vertical movement of the collars.

Lower Racking Unit. The lower racking unit, located immediately above the first girt, is similar to the upper racker, differing mainly in that the end of the racking arm is equipped with an air-actuated claw which encircles the drill pipe. The claw is constructed to permit vertical movement of a pipe stand while it is being guided. This unit is likewise equipped with a heavy duty drill collar hook, as shown in Figure 8, mounted on the arm immediately behind the claw in such a manner that it can be pivoted about the arm into a horizontal position by actuating a latch. When the hook is not in use, it is latched in a vertical position, as shown in Figure 9. The lower racker is controlled by the tong operator through the master control panel.

Traveling Block Deflector. During the initial phase of field testing the original power tongs and racking equipment, it was noted that the auxiliary pipe handling equipment was idle during the time the empty traveling block was ascending or descending. In that the block moved through the center of the derrick, it was necessary that it reach the top of its travel before a single stand could be stabbed and made up with the auxiliary equipment. Also, it was necessary for the block to remain at the top while the last stand removed from the hole was broken, rotated out, and moved to the racking position. This led to the development of apparatus and a system for moving the block away from the center line of the hole when it is traveling empty.

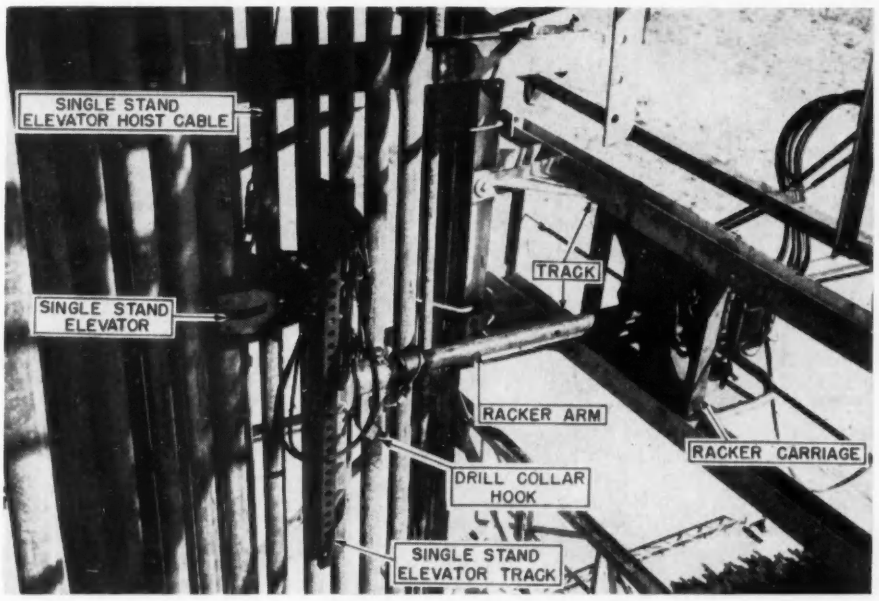


FIGURE 6. Upper racker. Single stand elevator grips and supports stand of drill pipe as it is moved by racking arm into pipe rack. Elevator will lower pipe to mat before releasing.

The traveling block deflector equipment consists of a rail which is attached to and extends vertically up the side of the derrick until it contacts the derrick at the twelfth girt, and from this point to the top, is parallel to the side of the derrick, as shown in Figure 10. The vertical portion of the rail is six feet from the center of the derrick. The rail lower section is hinged at a point ten feet above the floor to permit it to be fastened to the first girt in a horizontal position, as shown in Figure 2. The lower end of this rail hinged section is equipped with an air hoist which controls the movement of a wire line running up the outside of the derrick and passing over a sheave at the upper end of the deflector rail. The line extends down the inside of the derrick parallel to the rail and passes through sheaves on a carriage riding the rail and a sheave attached to the side of the traveling block, as shown in Figure 11. The end of the cable is anchored to the bottom of the rail, and deflection of the block is effected by shortening the cable. Figure 11 shows the traveling block in the non-deflected position while handling the drill pipe load, and the small carriage and cable system which follows the movement of the main block. Figure 10 shows the traveling block moving up the side of the derrick in a deflected position as the stand of pipe is being made up with the auxiliary apparatus.

Air-Operated Drill Pipe Elevator. The air-operated elevator is a standard, heavy duty elevator which has been converted by adding air cylinders for releasing the latch and for opening, and at the same time compressing springs located on the back side, and setting a trigger mounted on the upper portion of the elevator. The trigger, on contacting the drill pipe, is automatically actuated to permit the springs to close the elevator around the pipe. Figure 9 shows the elevator in the cocked position, and the trigger mechanism which holds the elevator open. Figure 11 shows the power elevator latched around and hoisting, drill pipe. Air is supplied to the power elevator by hose wound on a reel, with the end being attached to the hook body. The reel, which is mounted in the derrick as shown in Figure 10, is approximately 50 feet above the derrick floor and is equipped with an air actuator maintaining tension on the hose as the block moves up and down. The air-operated elevator is controlled remotely by the operator on the derrick floor by the manipulation of an air valve.

In coming out of the hole, as soon as the drill pipe is set on the slips and the upper racker engages the drill pipe, the operator on the floor applies air pressure which releases the latch and opens the elevator to a cocked position. As soon as it is cocked, air pressure is released, which allows the elevator to automatically close when triggered. Going in the

FIGURE 7 (left). Derrickman operating upper racker. Derrickman also controls claw on single-stand elevator. Raising and lowering pipe racking fingers are only manual operations required of him.

FIGURE 8 (right). Racking drill collars. Hook on lower racker arm is used for moving drill collars to and from pipe mat. Tongs are set for stabbing.

ELEVATOR TRIGGER
AIR OPERATED ELEVATOR
LOWER RACKING ARM CLAW
DRILL COLLAR HOOK
CONTROLS FOR AIR OPERATED DRILL PIPE ELEVATOR AND TRAVELING BLOCK DEFLECTOR
STABBING GUIDE
TONGS SCISSORED, GRIPPING JAWS RETRACTED, GATES CLOSED

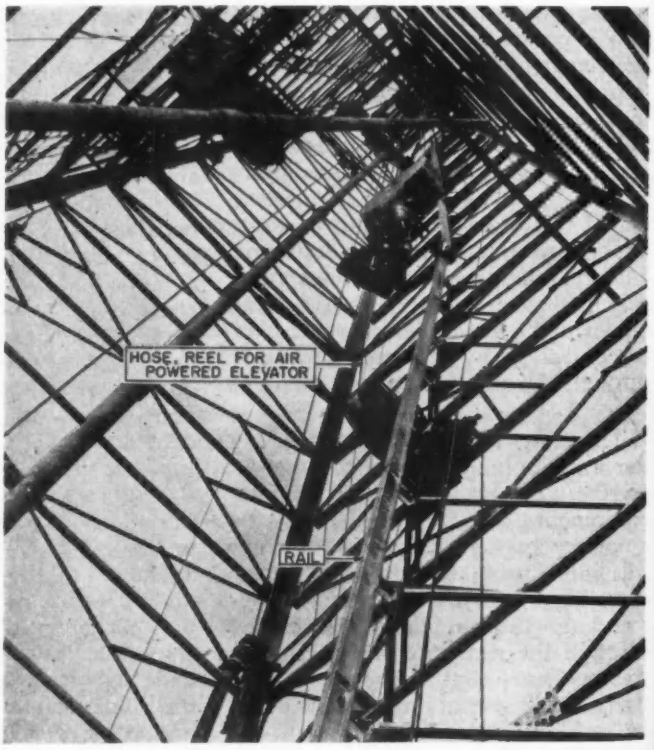
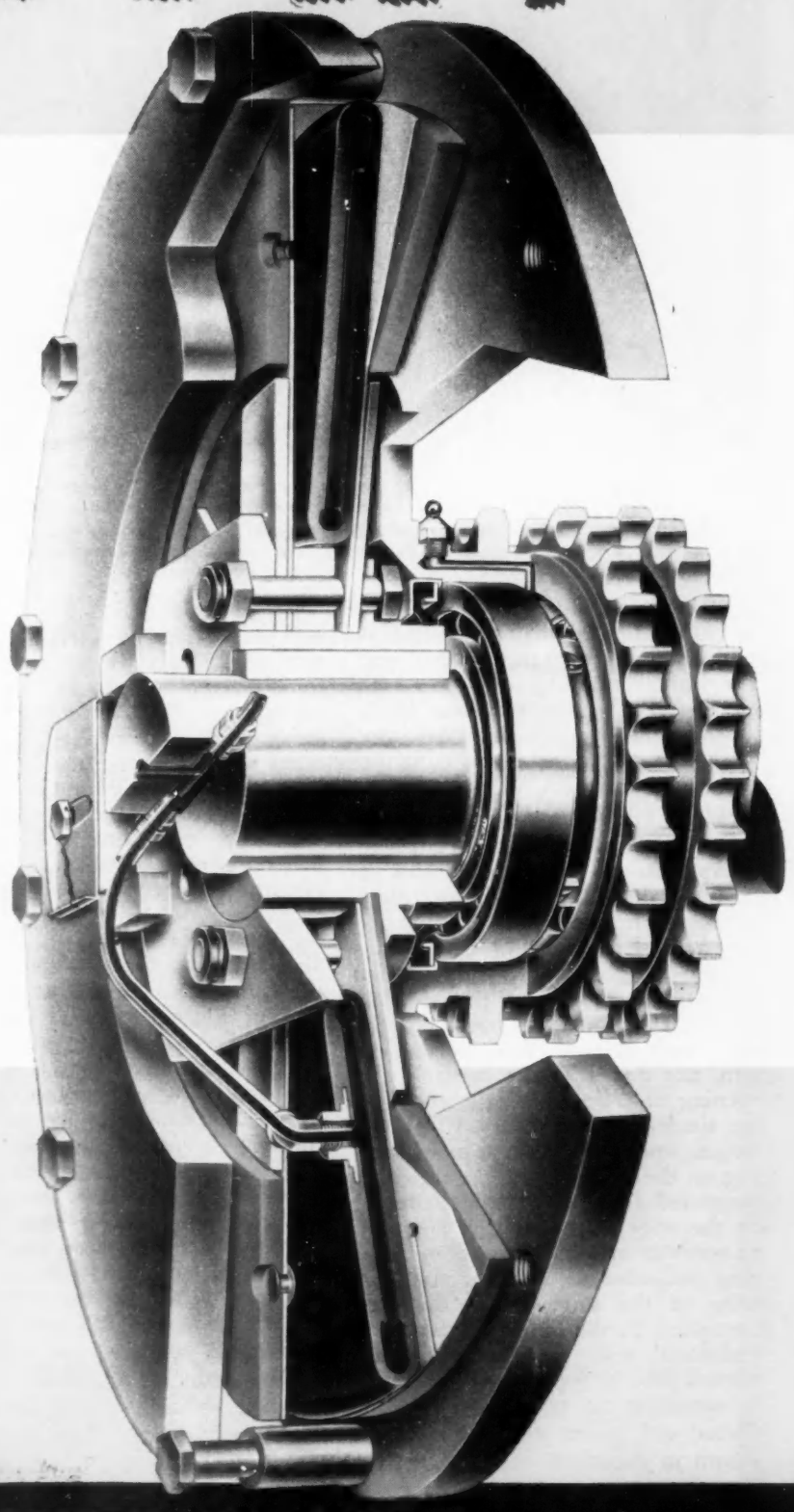


FIGURE 9 (left). Stabbing drill pipe. With tongs in position on tool joint box and with tong gates closed, stand of pipe is moved into stabbing position by rackers and lowered into box by single stand elevator hoist.

FIGURE 10 (right). Traveling block deflector rail. Deflecting traveling block while it makes empty trips greatly reduces idle time of traveling block, racking equipment and tongs. Vertical position of rail is six feet from center of derrick.

trouble in high speed friction clutches is

TEETH!



Our research on clutches has proved that when a clutch is engaged to pick up a load, the friction plates will not wear appreciably if:

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(2) Capacity of clutch is sufficient to avoid extended periods of slip.

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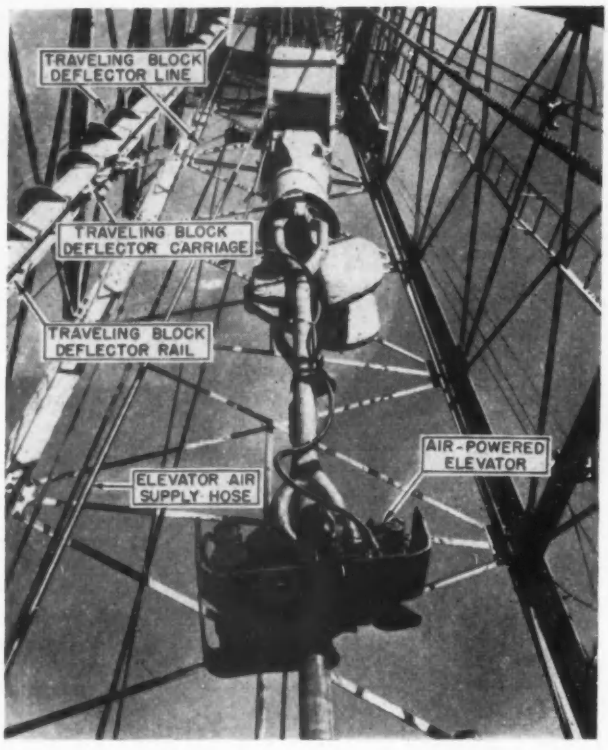

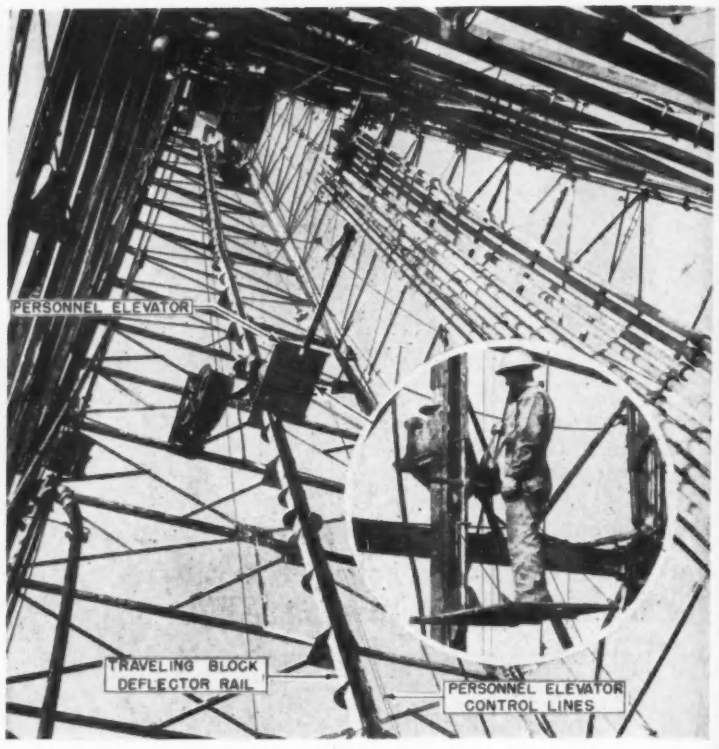

FIGURE 11 (left). Handling load with man hoisting equipment. Block is in its centered position. It is deflected by shortening deflector line, which shortens running loop between deflector carriage and block.

FIGURE 12 (right). Personnel elevator and casing stabbing board. Personnel elevator is guided by deflector rail and powered by air winch. Besides serving as elevator for derrickman, it is convenient working platform which can be used at any height in derrick.

hole, the same general procedure is followed by the operator on the floor. The horizontal motion imparted to the elevator by the traveling block deflector provides the necessary motion for engaging and disengaging the drill pipe without the necessity of manual guiding.

Operation of the Pipe Handling Equipment. All of the movements of the upper drill pipe end are controlled by the racking arm, the derrickman's only manual operation being to lower the racking fingers in coming out of the hole and to raise the racking fingers when going in the hole. In addition to controlling the racking arm, the derrickman controls the opening and closing of the claws in the single-stand elevator. All of the tonging operations and the pipe handling on the derrick floor are remotely controlled from a stationary console on the edge of the derrick floor, by an operator in a seated position. Gripping and subsequent raising and lowering of the single stand are also controlled by the tong operator. One additional man is engaged on the derrick floor in doping tool joints and in actuating the traveling block deflector and power elevator controls, shown in Figure 9.

Coming Out of the Hole. By the time the slips have been set, rackers are placed on the drill pipe. Immediately thereafter the main elevator is released and the traveling block is deflected off center and begins lowering, as shown in Figure 10. The tongs move into position around the pipe and both upper and lower tongs grip and are scissored to break the joint. The tongs are then released and start retracting as a single-stand elevator on the upper racker grips the pipe and serves as a backup while the rotary table spins the string of pipe in a clockwise direction. After the control is actuated to effect the grip of the single-stand elevator, a sequence valve is energized which actuates the single-stand elevator hoist line pull-back, producing a preset force for jumping the pin out of the box as soon as the tool joint is spun out. While the breaking and spinning out are being accomplished, the traveling block has been lowered in the deflected position and as soon as the elevator reaches a predetermined point and the single stand has been removed, the block deflector is released, allowing the elevator to automatically latch around the pipe in the hole. While the next stand is being hoisted, the rackers and single-stand elevator move the single stand of pipe mat and racking fingers, and then return to a central position ready to receive the next stand of pipe.

Going In the Hole. When going in the hole, the single-stand elevator is set at the bottom of its track. The upper and lower rackers engage and pick up the stand of pipe from the mat and racking fingers and move it to a position just clear of the traveling block while the previous stand made up into the string is lowered into the hole and set on the slips. The main elevator is opened and deflected off center by the traveling block deflector as it starts rising, as shown in Figures 2 and 9. The operator then moves the next stand of pipe, being supported by the rackers, to the center of the derrick and at the same time moves the tongs up to the tool joint box set above the rotary and closes the tong gates, as shown in Figure 2.

The chute mounted on and above the upper tong jaw serves as a guide for centering the pin on the box, and the stabbing operation is completed, as shown in Figure 9. After the stand of drill pipe has been stabbed, the spinning rollers are energized and the stand rotated in a clockwise direction until shouldered. The two tongs then grip the tool joint and the final tightening up is completed by the clockwise rotation of the upper tong. The predetermined make-up torque is limited by regulating the hydraulic pressure applied to the tong actuator

4 Big Reasons Why...

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installed the LeBus Grooving & Wire Line Spooling System..!

Pictured is the drawworks of the Buzzini remote control rig, located beneath the derrick floor. This drawworks was grooved by LeBus.

This is a derrick floor view of the Buzzini rig showing the remote control panel on derrick floor with drawworks beneath the derrick floor.

The Buzzini Drilling Company, pioneer operators of Remote Control Drilling Rigs, are thoroughly convinced that by installing the LeBus Grooving and Wire Line Spooling System they have greatly added to the efficiency of their rigs. The four statements by Buzzini that follow show just how they have benefited by LeBus Grooving Installations.

1. *The LeBus Grooving and Controlled Pyramid Wire Line Spooling System has benefited us most by smoothing out the wire line travel on the drum and by making it possible to cut off and change drilling lines more rapidly.*

2. *The LeBus system saves us valuable drilling time by allowing us to lower the pipe into the hole more rapidly plus the great saving in time when making line changes.*

3. *Our drilling and wire line costs have been reduced since using the LeBus System because we get additional wear on our wire line and our crews make their line cut offs at more regular intervals.*

4. *We now get more Ton Miles on our wire line since there is practically no cutting in, squeezing, pinching, and wire line whip.*

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cylinder. While the stand is being stabbed, spun, and made up, the traveling block has been rising in the deflected position and when the main elevator has reached the desired height, the block deflector is released. This allows the elevator to swing in and automatically engage the pipe.

Auxiliary Equipment

Personnel Elevator and Casing Stabbing Board. After installing the traveling block deflector rail in the derrick, it was concluded that it would accommodate equipment which would provide means for raising and lowering the derrickman to and from his working position. The elevator mechanism, shown in Figure 12, consists of a trolley, similar in general to the carriage used with the block deflector, which is equipped with a working platform. Small wire lines, extending from the top of the derrick through a control lever on the platform and down to the throttle on the air winch mounted on the lower end of the deflector rail, are controlled by the man riding the elevator. The elevator mechanism is provided with a foot-operated brake in addition to an emergency safety brake which automatically engages the rail when the hoisting cable becomes slack. While the traveling block deflector is in operation, the personnel elevator is lowered into and fastened to the bottom section of the traveling block deflector rail. This section of the rail is then raised into a horizontal position, as shown in Figure 2. The use of this equipment in running casing of varying lengths has resulted in a saving of time in that the derrickman can quickly adjust his height to the most convenient working level.

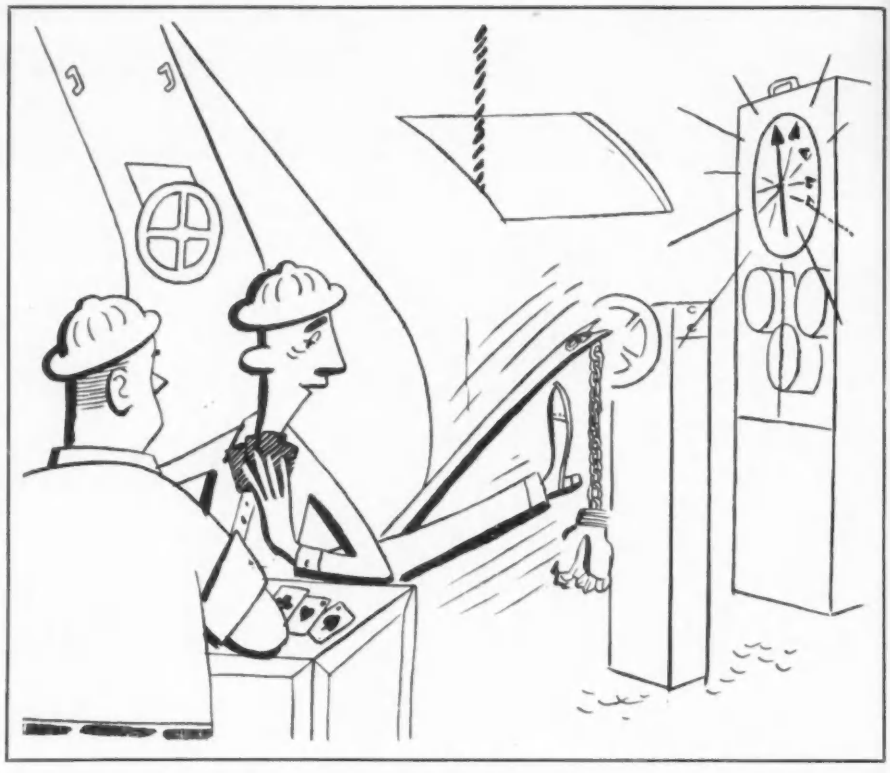
Conclusion. Research work was started on the development of equipment for handling drill pipe in the derrick to cope with the special problems encountered when drilling at greater depths, to reduce the amount of physical effort on the part of crews, eliminate hazards and to increase speed when making round trips. This discussion is to acquaint the drilling industry with the progress that has been made in the development of this type of equipment and to show some of the features now in operation.

REFERENCE

[1] AIME Paper "Semi-Automatic Power-Operated Drilling Machinery" by Martin E. True and Bert L. Stone.

ACKNOWLEDGMENT

This paper was presented at the Spring Meeting of the Pacific Coast District, Division of Production, American Petroleum Institute, Los Angeles, May, 1952.



Keep uniform weight on bit since too much variation is one of most frequent causes of poor bit performance.

Ten Rules

■ CONTINUED FROM PAGE 130

tions. When making up bit, use jerk line and tongs only. Running bit up with rotary table could damage the connection. After bit is made up, check all cutters to see that they turn freely.

- BE CAUTIOUS WHEN GOING IN HOLE—especially where ledges are encountered or there is a possibility of under-gauge hole. It is easy to damage a bit severely before drilling is started unless caution is observed.
- START CIRCULATION AND ROTATE slowly before reaching cavings and cuttings. Under average conditions, this means circulating while running the last joint of pipe.
- GO EASY TO START WITH. Use light weights until the bit has drilled enough to true up the contour of the bottom of the hole left by the dull bit—usually a few inches should be sufficient. Many broken teeth and damaged bearings result from failure to observe this rule.
- USE OPTIMUM SPEED AND WEIGHT. This depends on rig, formation encountered, bit used, and many other variables. The toolpusher's instructions should be followed carefully.
- KEEP UNIFORM WEIGHT ON BIT. Too much variation in drilling weights is one of the most frequent causes of poor bit performance. Some rigs with automatic weight control report drastic improvements in bit performance. Other operators find that recording weight indicators quickly pay for themselves. In most cases, however, it is up to the driller to keep a uniform weight on the bit.
- AVOID "BALLING UP" BIT. In formations where balling is likely to occur, increase circulation if you can. Otherwise, reduce drilling weight. Often bits are balled up when making connections because the slush pumps are not started before the bit is lowered into the cuttings, which probably have settled back to the bottom of the hole. If a bit does become balled up, don't spud the bit in an effort to clean it. More often than not the bit will hit the bottom of the hole so hard it will be damaged.
- TAKE CARE OF "GREEN" BITS. If a bit is pulled "green" for any reason, clean and oil the bearings immediately and place it in a bit box. A little care here will result in more footage when the bit is re-run.

By following these ten suggestions, operators can avoid many of the bit troubles that would otherwise be encountered. As a result, more bits will deliver the full life built into them by the manufacturer. Expensive round trips will be reduced and drilling costs will be substantially lowered.

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Public Liability And the Contractors

One-package Insurance Policy Is Now Available to Industry

By FORD BELL

Joe H. West and Company, Tulsa

Can you afford this?

FROM the drilling contractor's standpoint, no insurance coverage requires more careful consideration than public liability insurance. The contractor covered by a policy merely to meet requirements of his clients is apt to find that he lacks needed protection when a serious loss is sustained. Today the drilling contractor can combine in one policy all of the following protections that once required several separate contracts.

Auto liability.
Non-ownership liability.
Hired car liability.
General liability on operations.
Products (completed operations) liability.
Contingent liability for operations of independent contractors.
Contractual liability.
Underground property damage liability.
Property in care custody and control.

Obviously, one insurance policy that contains all of the above coverages must be carefully prepared by the drilling contractor and his insurance agent if he is to get a policy that has neither too much nor too little protection.

The following items should be reviewed in preparing a public liability insurance policy that will fit the needs of the individual drilling contractor:

HIGH LIMITS:

Don't be conservative in the amount of the policy. Insurance is bought to protect against losses that are too big for the contractor to afford. If he cannot afford to have a loss of $50,000 he can even less afford to have a loss of $500,000. Buy at least $100,000 per person but consider carefully the need for limits, as high as $1 million or more, on certain risks.

AUTO LIABILITY:

This protection is universally carried and understood. Policies should include all phases of auto liability insurance:

GENERAL LIABILITY ON OPERATIONS:

All policies will also carry this protection. It is bought at a rate per $100 of payroll and covers the contractor's liability to the public for accidents arising out of his operations. This coverage will include protection for injury to children, sight-seers or employes of the company who might be injured at the well. It will cover fire damage to farmers' fields. It will cover liability for all acts of employes who accidentally injure members of the public during the time they are working for the contractor and at his direction.

PRODUCTS LIABILITY:

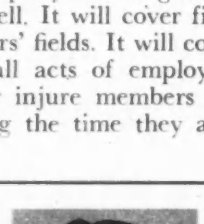
Unless this coverage is specifically included in the public liability policy, the contractor will not have protection against accidents at locations where he has completed the job and moved off. Some time ago one of our insureds finished a job, cleaned up the location and moved off. About a month later several cows found a can that had contained dope used on casing joints. This dope has a salty taste and appeals to cows. It also contained white lead and poisons them. The contractor was liable for this loss, but his insurance would not have paid unless he had the products or completed operations coverage. This is usually added to the policy at a rate per $1000 of gross receipts.

CONTINGENT LIABILITY FOR OPERATIONS OF INDEPENDENT CONTRACTORS:

The drilling contractor may not hire independent contractors. In fact, he is more apt to be asked to buy an owners' contingent liability policy in the name of the oil companies to pro-

■ CONTINUED ON PAGE 155

About the Author



FORD BELL was educated to be an advertising and publicity man, but in 1938 he left that field for the insurance business. Today he is a partner, together with Joe West and Bob McMasters, in the insurance agency of Joe H. West and Company, Tulsa, Okla. They specialize in the insuring of seismograph, manufacturing and drilling operations.

Gas Drilling Technique a Success

Better Penetration Rates, Reduced Bit Wear, Elimination of Lost Circulation Problem Keynote Progress Made in San Juan Basin

By GILBERT M. WILSON
WORLD OIL Staff

THE SAN JUAN Basin, in the short period of about a year, has seen the gas circulation technique emerge from an experimental procedure, to one that now is considered successful operating practice. Making the record even more impressive is the fact that operators who have taken up this relatively new technique report substantial savings in reduced bit wear, virtual elimination of lost circulation problems, reduced rig time on each well and far less wastage of gas normally lost while a well was being completed.

The detailed story of the gas drilling technique in the San Juan Basin, the manner in which it first was used and details of operating procedure, have been told previously (WORLD OIL, August, 1951), but for a brief review of the technique, the following highlights of the method are given in brief form.

Principal application of the gas circulation technique so far has been in Mesa Verde wells of around 5000 feet total depth. These wells have a gas pay zone thickness of from 700 to 800 feet, the zone consisting principally of alternating sands, shales and some coal stringers. It was in the pay zone that expensive and time-consuming lost circulation problems were encountered using conventional rotary mud for circulation. Use of cable tools for drilling-in work was resorted to by some operators but even this did not provide the answer for drilling problems and fishing jobs still were frequent. In fact, some cable tool fishing jobs required as much as several months to clean up. During cable tool operations, of course, the hole was open and large quantities of gas were blown to atmosphere. This created not only a hazard to workmen, but represented a substantial loss in production from the particular well.

Seeking a method by which drilling time and costs could be reduced, El Paso Natural Gas Company, on reviewing results being obtained by geophysical companies in the use of air for drilling shot holes in arid areas of the Southwest, decided to drill a well using natural gas as the circulating medium. With only slight modification of equipment, one of the company's large rigs was converted to the use of gas. The results were amazing, for footage could be made much faster and with little or no delay caused by fishing or other troubles and production from wells was improved due to lack of contamination frequently caused by mud. The system thereupon was adopted for the company's drilling-in operations.

FIGURE 1

A 4⅝-inch plug type diamond bit which drilled 408 feet of hole at rate of 11 minutes per foot in Mesa Verde formation between 4870 and 5278 feet.

Faster Penetration

Some idea of how drilling-in operations have been reduced from a matter of weeks or months to a matter of hours, can be gained by studying Table 1, which shows the results obtained by El Paso Natural Gas Company over the past approximately one year's operation.

Of considerable interest is the comparison of penetration rates between mud and gas circulation techniques. Prior to the use of gas circulation, about 150 to 200 feet per day could be drilled with conventional mud circulation. With gas, drilling rate, in the same types of formations, jumped to a rate of about one-half to one foot per minute. Not only that, but bit life was prolonged. For example, a bit which used to make 80 feet of hole—and this was considered a fairly good run with mud circulation—now could be counted upon to make from 300 to 400 feet of hole before having to be pulled. This extra bit life, of course, had still another important effect on completion time for longer bit life meant that the bit stayed on bottom longer and reduced the number of round trips formerly required.

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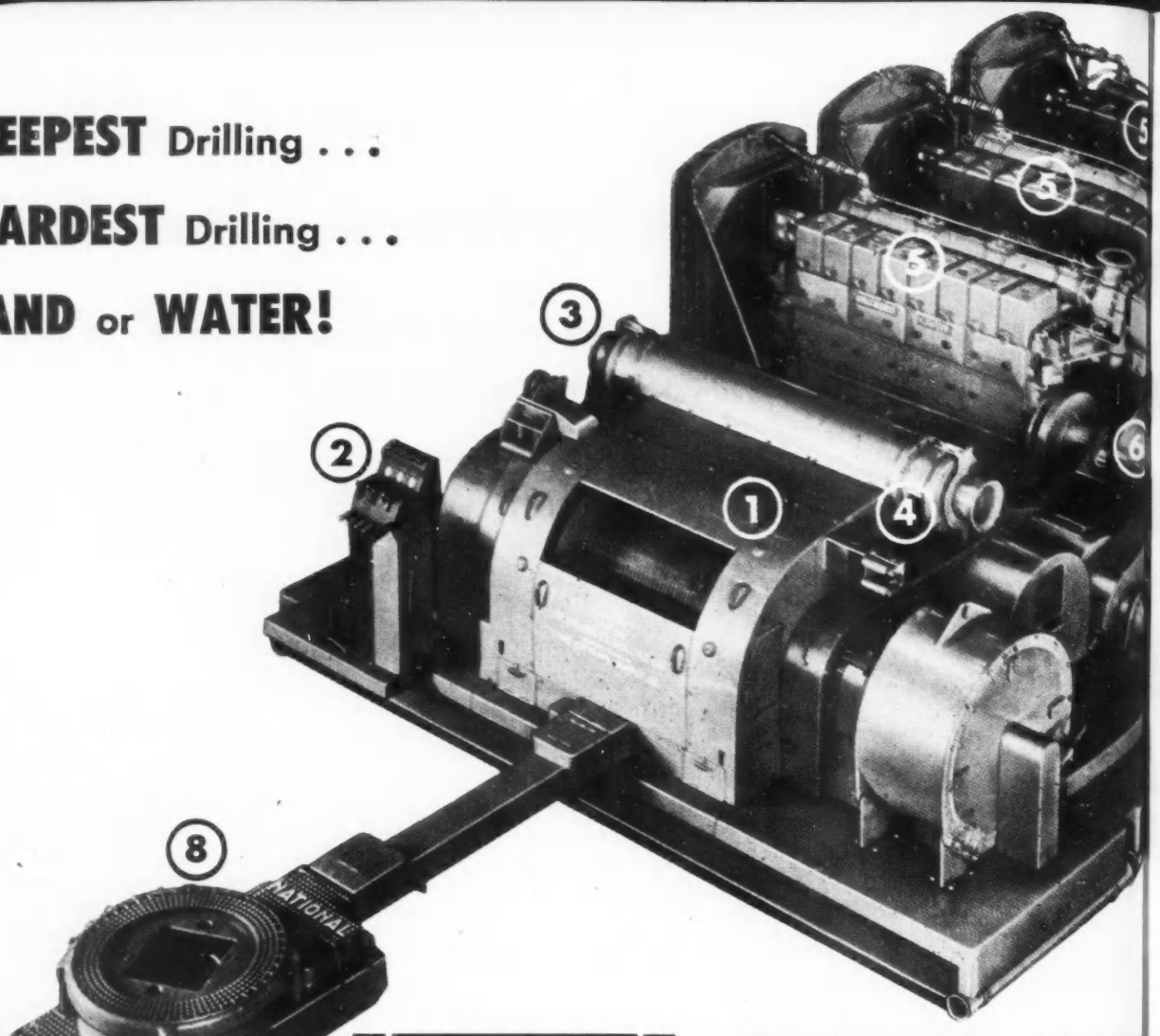

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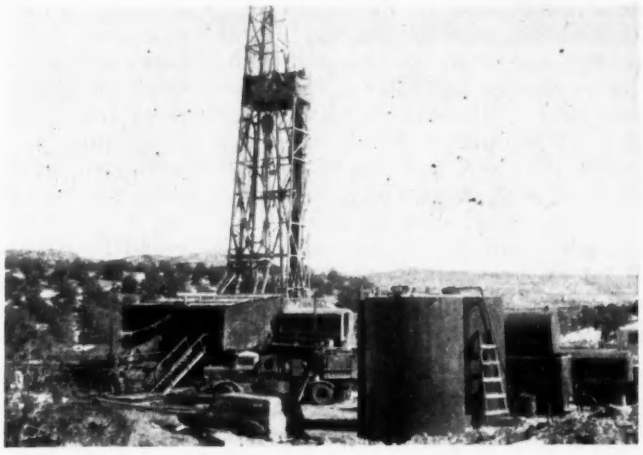


FIGURE 2 (left). Development costs are cut by being able to move off heavy rig after setting pipe, then completing well with light rotary-equipped cable tool unit. Typical of access problems is this wildcat location on Colorado side of basin which during winter periods often is accessible only by four-wheel drive or half-track equipment.

FIGURE 3 (right). Wells are being drilled with conventional rig, shown above, to top of gas pay formation, using mud circulation. Then they are drilled-in, shot, cleaned out and completed with light rotary-equipped cable tool unit using gas for circulation. Rugged terrain is typical of some parts of San Juan Basin.

to gas circulation. Source gas, at from 500 to 600 pounds per square inch pressure, taken from a nearby flow line or trunk line, is piped to the bottom of the standpipe; a master control valve, pressure gauge and variable choke being installed at derrick floor level for easy control from that point. A standpipe blow-down valve, operated whenever a connection is broken so no gas will be blown out on the floor, must be provided. The casing head connections likewise are simple. A full-opening master valve is attached to the top of the casing and on top of that is a spool with 2- to 4-inch size outlets on each side. Blow-out preventers are installed above this spool. Gas returns, carrying cuttings in practically dust form, emerge through the spool outlets and on through a several-hundred foot flow line to a flare.

Although drill pipe and surface fittings through which gas is passed are checked at frequent intervals, little damage from abrasion has been experienced.

After a year of intense study and use of the gas circulation technique, El Paso Natural Gas Company, as well as some other operators and contractors in the area, have pretty well standardized on the procedure. At the present time, general practice consists of setting pipe with the large rig, using conventional drilling mud down to the casing point. From there on down, however, the drilling-in is done with a light drilling unit. At the present time El Paso has two cable tool rigs equipped with an auxiliary chain-driven rotary attachment; one using a rotary table and the other using a direct-drive rotating drilling head. A third unit, a light rotary rig, also employs a rotating drilling head.

Drilling-In Time Averages 48 Hours

Drilling-in time, using gas, for the typical 800-foot Mesa Verde section, averages about ten days, depending upon weather, road conditions, etc. This time includes moving in, drilling, shooting, cleaning out, running tubing, hooking up the well for production and moving out. Actual drilling-in time on Mesa Verde wells averages about 48 hours, although the section, in some wells, has been drilled in as little as 20 to 30 hours. Cleaning out time, after shot, averages about 34 hours, although, on some of the larger wells, where a high volume of gas from the formation helps to clean out the hole, the job may be completed in as little as from one to three hours, actual cleaning out time. Current practices for drilling-in consist of using a gas volume ranging from 1500 to 3000 mcf per day rate and at a pressure of about 350 psi. Drill pipe usually is rotated at about 80 revolutions per minute, with about 10,000 pounds on the bit. Table 1 provides a breakdown of significant data pertaining to some 23 wells completed with the gas circulation technique.

The light rotary rig mentioned above ordinarily is set up to handle 3½-inch drill pipe and 4¼-inch drill collars. The modified cable tool rigs use 2-inch externally upset tubing and, for a drill collar, use is made of either a 4¼-inch collar or several joints of 3½-inch drill pipe, whichever happens to be available at the time the rig is set up on the job. Some holes have been drilled-in without drill collars. Generally speaking, a good straight hole is obtained and little trouble is experienced afterward either with getting shots to bottom or in running electric logs or other bottom-hole instruments.

Diamond Bits Used Successfully

More recently, some drilling has been done, still using the gas circulating technique, with a diamond concave plug-type bit. The bit has a concave cutting surface, with three slots which radiate out from the center, serving as circulation ports. Two sizes so far have been used: a 4⅝- and a 6¼-inch. On the former, Figure 1, the bit made 408 feet of hole, with penetration rate of 11 minutes per foot. It was used on a string of 2⅞-inch O.D. tubing used as drill pipe. Drilling weight averaged about 10,000 pounds. Gas at 300 psi, at a rate of approximately 2000 mcf per day, was used in this particular instance. When pulled, the bit still had considerable drilling life left. Salvage value of the diamonds was approximately 54 percent.

The 6¼-inch plug bit used, of the same design as the one illustrated, was used in a well in the La Plata County, Colorado, side of the basin. This particular bit cut 106 feet of formation

at a rate of 7 to 8 minutes per foot. Drilling indicator weight was 10,000 pounds and rotary speed was 70 rpm. Gas at 500 psi and 1500 mcf per day rate, was used as the circulating medium. When pulled, the bit was in excellent condition and was to be used in a subsequent job. This particular run was a short one because it was brought in to do one particular job. A lateral hole had been whipstocked off into the formation and, to save running another whipstock when vertical hole drilling was resumed, the concave diamond bit was used to continue the straight hole, starting at the point where the lateral took off and continuing on down. Drilling was continued in this well until softer shale bodies were encountered, making it more advisable to pull the diamond bit and go in with a conventional rock bit.

Benefits realized during the first year of drilling-in with the gas circulation technique can be summarized as follows: Drilling-in time has been cut from a matter of weeks or even months, down to around 48 hours, this being a rough average based on a series of recent completions picked at random. Even this shortened time is not a fair average figure because the past winter was an exceptionally long and severe one, with many periods during which the comparatively

TABLE 1

Tabulated summary of wells completed by El Paso Natural Gas Company from start of gas drilling-in operations to first of this year. Note exceptional footage from bits; also remarkably short time required for drilling-in and completing most wells. Similar performance being realized in 1952 completions to date. Figures for total gas not available for some of wells.

Well	No. Days Rig on Location	Bit Numbers and Footage Made With Each	Actual Drilling Time, Hours	Cleaning-Out Time After Sho'-Hours	Total Gas Used for Drilling-In and Cleaning-Out MCF
A	10.4	No. 1—159 No. 2— 67 No. 3—283 No. 4—400 909 Total	39.5	49.5	9,501
B	13	No. 1—173 No. 2— 38 No. 3— 58 No. 4—481 750 Total	31.5	37	11,259
C	8	No. 1—167 No. 2—466 633 Total	68	36	6,398
D	8	No. 1—152 No. 2—200 No. 3—423 775 Total	58	32	7,021
E	39	No. 1—645 No. 2—125 770 Total	31	162	39,399
F	10	No. 1— 98 No. 2— 40 No. 3— 22 R.R.* No. 4— 92 No. 5—341 593 Total	34	1	9,738
G	23	No. 1— 90 No. 2— 26 No. 3— 0 No. 4— Drlg. Retainer No. 5—242 No. 6—292 No. 7— 73 No. 8—674 1397 Total	40	8	11,113
H	8	No. 1—268 No. 2—212 480 Total	33	3	.....
I	11	No. 1—227 No. 2— 65 (Reaming) No. 3—355 No. 4—160 807 Total	35.5	27	8,658
J	10	No. 1— 87 No. 2—110 No. 3—448 645 Total	51	48	11,196
K	5	No. 1—393 No. 2—248 No. 3— 60 701 Total	49	8	4,244
L	6.5	No. 1—160 No. 2—425 585 Total	34	16	5,261
M	15	No. 1—153 No. 2— 67 No. 3— 61 No. 4— 25 No. 5—490 796 Total	62	8	6,691
N	14	No. 1—210 No. 2—526 No. 3—104 900 Total	35	62	16,530
O	7	No. 1—185 No. 2— 30 No. 3— 10 No. 4—300 R.R.* No. 5—305 R.R.* 830 Total	61.5	2	6,939
P	5	No. 1— 59 No. 2— 88 No. 3—592 739 Total	33	36.5	3,675
Q	6	No. 1— 82 No. 2—660 742 Total	44	16	1,821
R	12	No. 1—404 No. 2—110 No. 3— 35 No. 4— 6 No. 5— 5 No. 6—494 1054 Total	48	8	.....
S	16	No. 1—780 Total	33	108	26,343
T	13	No. 1—160 No. 2—425 No. 3— 8 No. 4— 8 No. 5— 10 No. 6—202 No. 7—150 963 Total	117.5	5	19,103
U	10	No. 1—153 No. 2—313 No. 3—267 733 Total	21.5	74	.....
V	8	No. 1—108 No. 2—500 No. 3—138 746 Total	31	8	8,522
W	8	No. 1—120 No. 2—130 No. 3— 40 No. 4—385 675 Total	74.5	21	9,000

* Re-run.

few roads in the area were blocked with snow or mud, making it impossible for crews or equipment to move in the field. The amount of gas wasted during drilling-in operations has been reduced very substantially due to the shorter time required in this improved method. During the seven months between the first use of gas, beginning in May, 1951, 31 wells were drilled-in by El Paso and an estimated 15 to 20 more were completed in like manner by another operator in the area. An additional 40 wells drilled by El Paso, and approximately 20 wells drilled by other operators since January 1 of this year have been completed up to the time of this writing, using the gas circulation technique.

Clean-Out Work Simplified

An example of another use of the high pressure gas used for drilling can be seen in the cleaning-out operations which begin when the drilling-in unit is set up on the well and in which casing already has been set. Instead of swabbing or bailing out mud and water from the hole—an operation that requires an appreciable amount of time, not to mention wire line wear, swab rubbers, etc.—the fluid is blown out of the hole. With the light rotary unit rigged for drilling-in, a few joints of tubing (or drill pipe, if that is used for the string) are run in the hole and the fluid to that point is blown out. A few more joints are put on and that increment of the fluid column is blown out. This is continued on down to the cement plug where gas rotary drilling operations are commenced and continued on through the pay zone. It requires an average of 10 million cubic feet of gas to blow, drill in and clean out an average Mesa Verde well. One advantage in using tubing as drill pipe lies in the fact that when the well is cleaned out to bottom, the string may be left in the well as a flow string. This saves having to haul drill pipe both ways.

Correct Handling Eliminates Hazards

After a year's experience in using the gas circulation technique, it can be said that little danger of fire exists if reasonable precautions are taken and ordinary safety rules are observed. No fires are known to have been caused as a direct result of the use of the technique in the San Juan Basin area. Only a few simple rules for safe operations need be observed. One of these is the need for closing the main control valve at the standpipe and opening the standpipe blow-down valve before breaking out a joint in the drill string. If the return lines, flared some distance from the rig, are kept open, the gas in the annular space between the drill pipe and hole always will be vented, so it is necessary only to vent the drill string before breaking a joint. With these principal exceptions, and of course the need for the driller to watch gas pressure and volume going through the system, there is little that differs from conventional rotary mud drilling.

An important precaution brought out in the earlier article, and one that still is valid, concerns the care that should be taken to see that circulation gas is kept dry. Moisture in the gas, or excessive moisture that might be encountered in the formation, tends to mud up the cuttings, occasionally forming a bridge in the hole above the bit. It has been found, however, that by periodically raising the string the length of the kelly and rotating back down, the hole can be kept open and tendencies to bridge held to a minimum.

Besides El Paso's three small drilling-in rigs, which are owned and operated by the company, two rigs, owned by Delhi Oil Corporation, and one each by three drilling contractors, use the gas circulation technique. In addition, if desired, three large rigs owned by El Paso could be rigged for gas drilling operations. One of these rigs, in fact, was the one originally rigged up for the operations described in the earlier article dealing with the technique.

A detailed breakdown, in the accompanying tabulation, presents rig time, bits used and footage for each, actual drilling time in hours, cleaning out time after shot and amount of gas consumed for wells completed during the last half of last year by El Paso Natural Gas Company using the gas circulation method. Only in several instances was average drilling time appreciably higher than the general average, and these can be attributed to the occasional problem wells that usually show up in a long string of completions regardless of the particular completion technique used. Delays at the rig occasioned by periods of bad weather, during which service companies or relief crews might not have been able to reach the well, doubtless contributed to some of the longer-than-usual periods indicated for certain of the completions.

Public Liabilities

■ CONTINUED FROM PAGE 146

tect them from his acts. However, there is no set rule to cover this situation. Therefore, if the contractor does hire independent contractors it is important to be sure that his policy is extended to cover his contingent liability in case an employe of one of these contractors should cause an accident and he should then be joined in the resulting suit.

CONTRACTUAL LIABILITY:

When drilling for any of the major oil companies it is certain there will be included in the contract a "hold harmless" or contractual liability agreement. All liability insurance specifically excludes contractual liability unless it is endorsed on to the policy. The proper way to do this is to furnish a copy of each "hold harmless" agreement to the insurance company. After it has checked a few of them it is possible the insurance company will give automatic coverage at a flat charge per well. This, however, depends on the insurance company.

PROPERTY IN CARE CUSTODY AND CONTROL:

It is still impossible for the drilling contractor to insure against damage to others' property in his care, custody and control under many circumstances. Some losses, however, can be insured. For example, liability for rented buildings can definitely be protected. Last year an insured rented a garage building in Canada for the purpose of doing repair work on cars and equipment. One day an employe backed a car into an open can of gasoline. The can was knocked into a fire and the resulting explosion killed the driver, burned the garage and car and also destroyed the house next door. Public liability insurance paid for the house next door. Auto fire and theft paid for the car. Compensation paid for the death of the employe, but no insurance paid for the garage because it was a building in the care and control of the insured. Insurance for this type of liability is now being written and can be included in the public liability insurance policy.

Of course, there are many other kinds of insurance that must be bought by the drilling contractor such as compensation, bonds, auto fire and theft, marine insurance on drilling rigs, etc., and all of these coverages require the careful consideration of both agent and contractor. No policy, however, has more phases or requires more careful consideration than does the public liability insurance policy.

Exploration Drilling Requires Special Equipment

Adequate Supplies and Surplus of Machinery, Mud and Associated Items Are Essential

By R. L. CHANCE
President, Chance Drilling Company

EXPLORATION drilling requires highly specialized rigs and equipment. Faced with many varied and unpredictable problems, the contractor must rig exploration tools to meet and solve each problem as it occurs. Quite often, a drilling problem will develop with no warning to permit preparation for its rapid and efficient solution.

Under the circumstances, adequate power, pump and mud system facilities must be provided to combat unexpected troubles.

Aside from efficient, flexible equipment with needed reserve allowances, the exploration rig must be manned by trained personnel. Inexperienced manpower can and often will hamper the rapid consumation of drilling problems even if the contractor is equipped with a modern, flexible rig. Thus, preparing for exploration drilling fronts the contractor with a two-fold problem—first, the requisitioning of decent equipment and the placement of trained crews on the rig.

Supplies Unavailable

Selection of a rig for the job and manning it with trained personnel does not complete the picture for exploration drilling. Often, supply stores are not accessible, hence the contractor must supply the rig with all necessary spare parts to attend to any equipment failure which might occur. Although an expensive requirement, supplying the rig with standby parts is a prerequisite to continued rig operation.

Parts must be stored and protected to assure decent workable condition when it becomes necessary to place the parts in service. If this condition is not observed, there is no sense in the practice of supplying the rig with extra parts and standby equipment.

Heavy Duty Power Plant Essential

The average rig is designed to supply adequate horsepower to both the drawworks and pump. For normal drilling, there is no need for surplus power assigned to either component. However, in exploration drilling, it is essential that aside from rigging with an adequate number of pumps, these units must be powered to allow necessary surplus in case of an emergency. Without cementing trucks in the vicinity of the rig, the contractor must have a heavy duty power plant available to combat potential blowouts and associated problems.

Aside from two compound driven pumps or one attached to the compound and one independently driven, the rig should be equipped with a third pump. Although this particular pump can be a smaller unit, its utility will be seen in mud conditioning, water pumping and associated problems.

Mud System Important

Penetration of unknown horizons demands the provisioning of an adequate working mud system with a reserve system available for immediate use. The occurrence of lost circulation, kicks, etc., will become a problem of less significance if the mud system is designed with adequate shale, reserve and suction pit facilities. Unless the plan is inaugurated, the existence of minor lost circulation or blow out problems will likely become more serious.

Depending upon expected conditions, it is essential to stock pile mud additives on location in preparation for a possible emergency. When weighted systems are required, it is wise to supply the location with an adequate amount of barites to at least rebuild or double the weight of the system.

In general, it is preferable to employ steel mud tanks if a costly, specialized system is contemplated. Particularly on deep, long life tests, these steel mud pits soon pay dividends to the operator.

Aside from complete jetting systems, the mud system should be equipped with at least two mud guns at each tank. In some instances, submerged agitators will offer certain advantages in mud conditioning processes.

Where it might become necessary to add large quantities of materials to the system, advantage is seen in supplying the rig with the bulk service control hopper now available—which will discharge the weighting material in excess of 250 sacks per hour, if needed. If lost circulation is contemplated, and if it is planned to employ tightly packed fibrous material, it is also wise to supply the rig with some sort of shredding device.

Requirements General

The requirements for exploration drilling rigs are rather general, but very important. In short, it is essential that the conventional infield drilling rig, when prepared for exploration drilling, be supplied with adequate power, pumps, surface mud system and standby materials. Aside from these items, which in many cases will be duplicate equipment, the only remaining provisions include decent and comfortable quarters for the toolpusher, engineer and crewmen. Particularly in the case of the toolpusher, it is quite important that comfortable quarters be provided for the many times that the pusher will be required to remain on the rig for days or weeks.

Planning for exploration drilling can be boiled down to the fact that an adequacy of equipment and supplies, plus decent quarters for supervisory personnel, must be recognized and supplied.

Outrigger Arm Improves Mast-Type Rig Operation

Simple Device Will Speed Hose Handling, Provide Additional Floor Space, Prevent Twisting

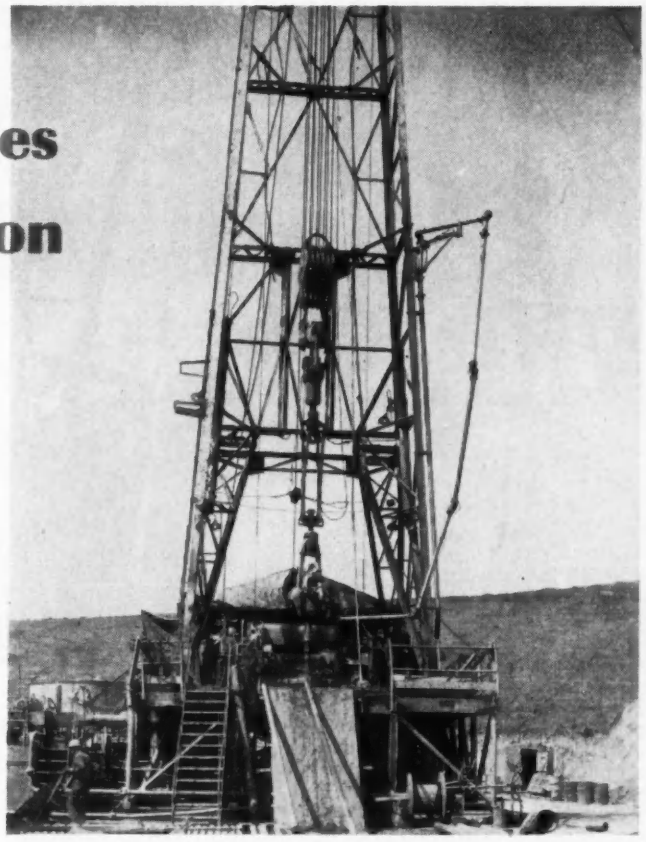


FIGURE 1. This view of mast-type rig shows how outrigger extension and swivel extension units are installed. Note that hose hangs down outside of derrick and even with kelly down, hose is well above floor.

A DEVICE has been designed and field tested which can hold the rotary hose outside the derrick enclosure during most of its travel and prevent it from rubbing against the derrick floor or other rig equipment. This development is of particular interest to operators of mast-type rigs. On this type of rig, working radius on the floor generally is small and space is at a premium. Adaptable to both steel and rubber rotary hoses, the outrigger unit, and a companion attachment that fits on the drilling swivel to straighten the hose fall from the gooseneck, combine to reduce wear and tear caused by kinking and abrasion and, at the same time, provide greater amount of working space on the derrick floor.

The outrigger arm (Figure 1) consists essentially of a fabricated steel arm, bracketed to the mast leg at the top of the standpipe, which supports a six-foot horizontal extension of the standpipe. The arm extends out from the open face of the derrick at an angle of about 30 degrees. This angle allows a natural travel of the hose in going from the well to the rat hole. The extension is equipped at each end with a 90-degree, ball-bearing swivel joint. The outrigger unit may be installed on either the left or right hand side of the mast, as desired by the operator.

Sharp Bends Eliminated

With either steel or rubber type hoses, the unit has the effect of providing increased flexibility, eliminating the rubbing of the hose against the mast leg and increasing the radius of bend in the hose, thus preventing damage commonly caused by kinking when the swivel is at the lowest or highest points of its travel. The outrigger device is designed in such a manner that, if the hose length is carefully determined, the hose will not contact the floor when the kelly is down or is in the rat hole; yet will be long enough to permit hoisting the swivel high enough to make mouse hole connections.

A companion device, designed to be used with the outrigger arm, is a drilling swivel extension. This unit (Figure 2) is bracketed to the side of the swivel, just below the gooseneck. The extension nipple is equipped with a 90-degree ball bearing swivel joint to bring the hose attachment point down to about the mid-point of the swivel body. Purpose of the swivel extension is to eliminate strain on the gooseneck and avoid the weakening effect of the hose section that frequently occurs two to three feet below the gooseneck connection. Constant vibration and pulsations of the hose at the point where the hose turns to a true vertical position frequently cause failures. The angle iron bracket which holds the extension is bolted to one of the existing studs (the regular stud must be removed and replaced with a longer one) in the top of the swivel body.

The combined effect of the installations, the outrigger arm and the swivel extension, is not only to assist in prolonging the life of the hose, but to actually make it possible to use a slightly shorter hose on any given installation. In the case of the steel hose, for example, only four joints, requiring four swivels, are used on one particular make of mast type rig. Only ten swivels are used in the entire installation, including outrigger arm, hose and the drilling swivel extension. Quick-

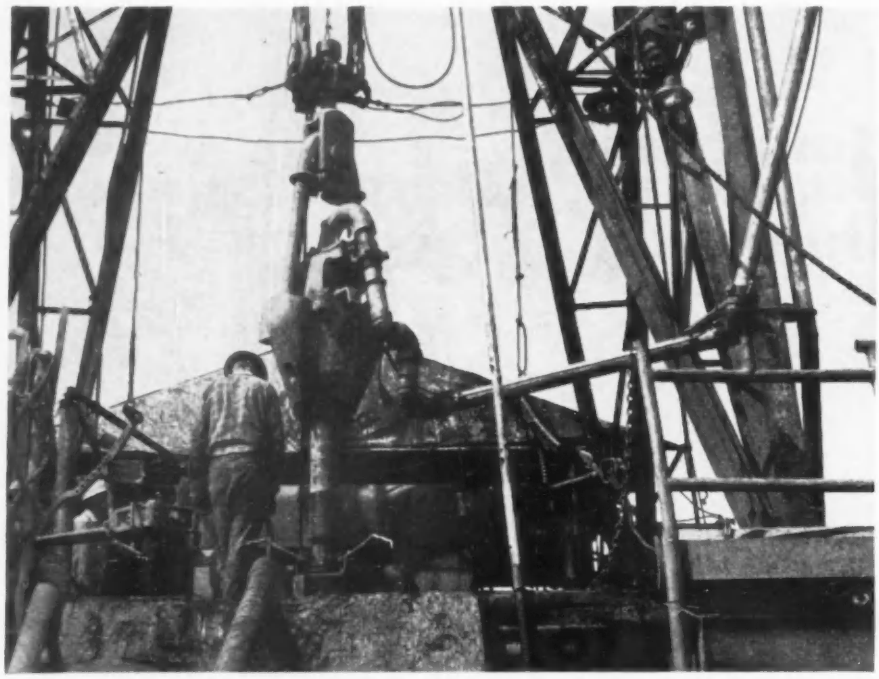


FIGURE 2. This close-up view shows swivel extension unit, bracketed to swivel body, which lowers point of attachment of hose. Unit reduces damage in hose section frequently caused by hose pulsations occurring 2 to 3 feet below gooseneck. It also eliminates sharp bend in hose when kelly is down at lowest point.

disconnect, hammer-type unions are provided on either side of each swivel joint and seal to ease maintenance. This allows replacement of completely assembled joints in the field with a minimum of rig down time. With rubber hose installations, a 40- to 45-foot length can be employed where formerly it required a 50- to 55-foot length.

Although the design of the installations eliminates sharp bends and abrasion of the hose when the kelly is down or is resting in the rat hole (Figure 3), it still is possible, with the same equipment, to make mouse hole connections, an operation that requires the lifting of the swivel to nearly twice the height in the rig as would be required if conventional pickups, using the elevators, were made.

The six-foot horizontal extension of the standpipe, which under normal operating conditions, rests in a saddle at the end of the supporting arm, can be lifted up through an arc of about 75 degrees, i.e., to within 15 degrees of vertical. A light cable clamped to the unit limits travel of the arm beyond that point. The single swivel connecting the horizontal extension with the upper end of the standpipe, allows the arm to operate in only a vertical plane. Ability to raise the arm has the effect of eliminating the need for extra hose that ordinarily would be necessary to prevent sharp bending of the hose at that point when the swivel is hoisted into the derrick far enough to permit making a mouse hole connection.

A spring-loaded lock pin, built into the bracket clamped to the derrick leg, limits rotation of the unit in a horizontal plane to approximately 15 degrees. When the extension arm is raised up off the cradle, such as when a joint is picked up from the mouse hole, the extension always returns to its position in the cradle, regardless of any horizontal movement of the unit that may occur.

By releasing the locking pin, however, the unit can be swung around in a horizontal plane to suit the particular needs of the occasion. When the rig is skidded or only partially broken down for off-highway travel, it is necessary only to pull the locking pin and swing the arm around until it is flat against the side of the rig where it then can be lashed to any convenient girt or cross brace to prevent movement when the rig is moved. A light cable attached to the locking pin runs down to the derrick floor, permitting easy release of the lock from the floor. Should a highway move be made, the entire outrigger unit can be removed merely by disconnecting a hammer-type union at the standpipe connection; at the point where the hose connects into the outer end of the extension; and the several brackets holding the unit to the derrick leg. The swivel extension unit also is equipped with a hammer-type union for easy uncoupling.

Designed specifically for portable type rigs, the units materially contribute to the reduction of the number of failures occurring in the rotary hose system, provide safer and improved working conditions on the derrick floor and reduce initial costs of the rotary hose itself.

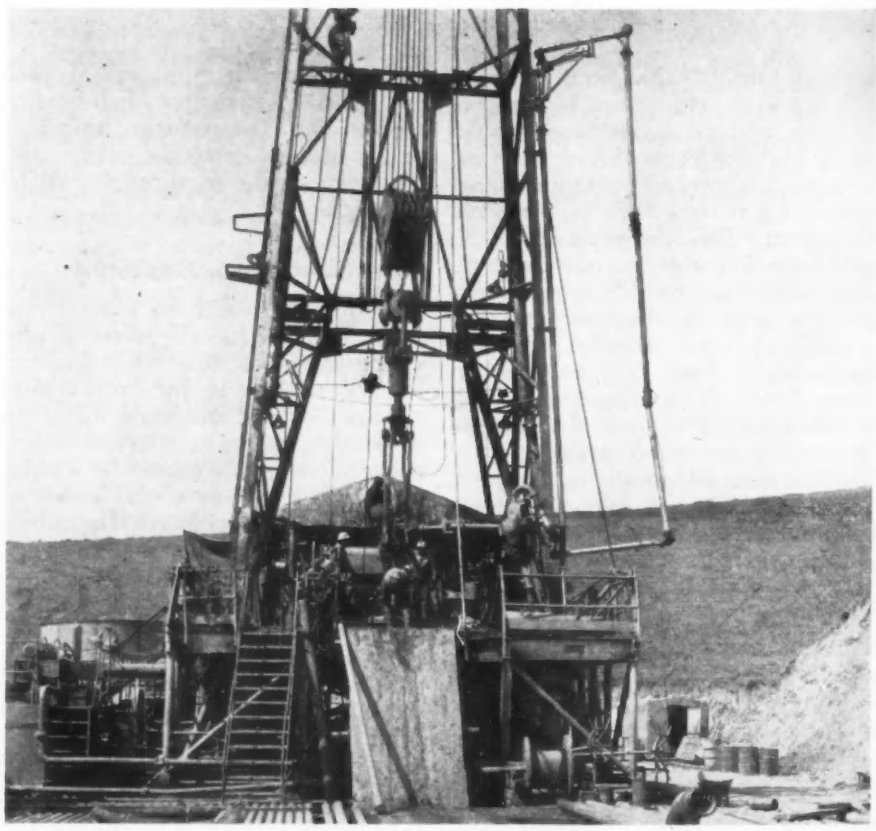
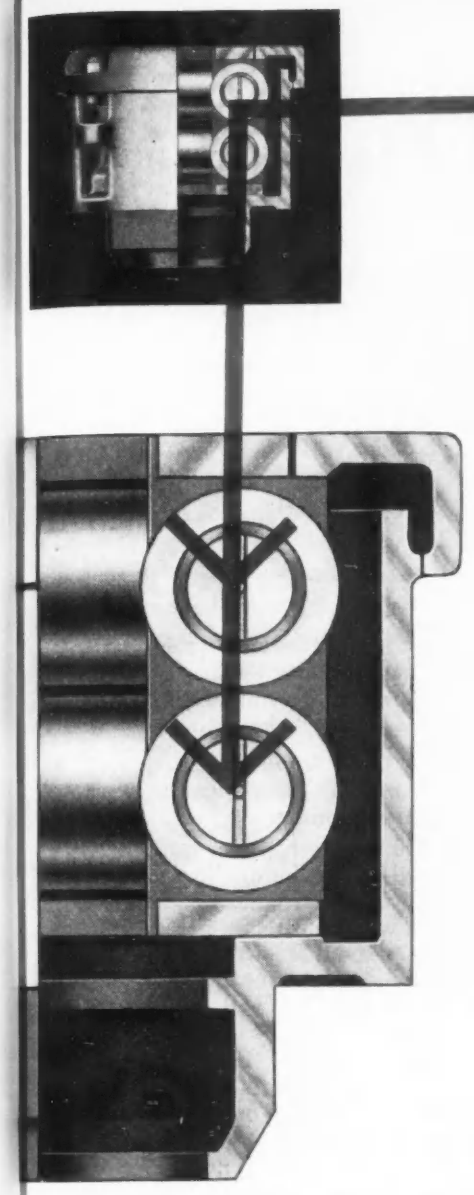


FIGURE 3. When kelly is in rat hole, rotary hose not only is held off derrick floor, but is held entirely outside derrick enclosure, giving greater working room on rig floor.



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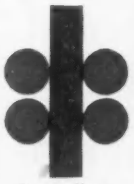
1. Because at least *two* rollers against each face are necessary to give stability to the kelly as it rotates (preventing gyration and wobble) . . . and to give adequate "non-corrugating" driving surface against each kelly face.



Two rollers give stability!

2. But more than two limits the size of each roller . . . necessitates smaller bearing areas and pin diameters . . . multiplies service and maintenance problems.

These engineering features are important, too . . .

In addition to the big advantage of having *two* rollers against each kelly face, these additional Baash-Ross features are also vitally important . . .

- **BRONZE BUSHINGS** between rollers and pins prevent steel-to-steel contact, resist galling under high torque loads, assure free rotation and quick response to the most delicate bit feed!
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- **INDIVIDUAL GREASE DUCTS,** centralized where they're easy to reach, assure proper lubrication to each separate roller and pin!
- **SOLID ONE-PIECE COVER** is unusually strong and rigid, yet easily removed when desired. Its streamlined surface has no projections to catch in lines or clothing—a vital safety advantage!
- **ROLLER ASSEMBLIES** can be quickly interchanged to adapt a single body to various kelly sizes. For example, one Baash-Ross Bushing fits *all* square kellys from 3" to 6" by simply changing the roller assemblies. Or the same Hex Bushing fits all hex kellys from 3½" to 7" by changing only the roller assemblies. Simple, quick—cuts bushing costs to the bone!

Baash-Ross Roller Kelly Bushings are available in sizes to fit all popular kellys . . . 2½" to 6" in square kellys, 3" to 7" in hex kellys.

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A 6-way saving in Drilling Costs!

Wherever Baash-Ross Roller Kelly Bushings are used, operators are enthusiastic over the multiple savings these modern bushings make possible. By eliminating the erratic bit control and sudden "feed-offs" inherent in conventional kelly bushings, Baash-Ross *Roller* Kelly Bushings keep the bit digging at a uniform rate, assuring . . .

1. **More footage per bit!**
2. **Faster drilling speeds!**
3. **Longer kelly and drill string life!**
4. **Longer rotary equipment life!**
5. **Reduced risk of twist-offs!**
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the Kelly Bushing into the rotary table, a Baash-Ross Kelly Bushing Guide Skirt is available. Fits all Baash-Ross "2RC" Roller Kelly Bushings . . . others on special order. Write for complete details!

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Training Program Must Be Planned

Here's a Tried and Proven Method for Effective Schooling Of Needed Technical Personnel in the Contract Organization

By JACK H. ABERNATHY

Vice President, Big Chief Drilling Company, Oklahoma City

ATTRACTING technical personnel to the contract organization is just a start in the direction of preparing an engineer for a full and profitable adventure in drilling. Training cannot be haphazard. A well planned and organized program must be set forth to not only train but retain the engineer's interest and enthusiasm. It is not a difficult program. There are many approaches. However, here is a tried and proven plan for the effective training of needed technical personnel.

In planning an effective training or trainee program, answers to the following questions must be arrived at, or assumed:

- What is the overall, long-range objective of the business unit doing the training?
- What is the long-range goal toward which the trainee is oriented?
- What deficiencies has the trainee's prior education left him which must be adequately met in order to qualify him for advancement, and to enable him to fill a useful, productive place in the organization?

Upon the answer to the first of these questions depends the overall slant of the training program. For example, an independent producing company owning one to three rigs used almost exclusively on the company's own work would necessarily have a different emphasis than would the program of the independent contractor whose rigs worked for a wide variety of customers. The answer to this question determines the type of men most needed by the business and the direction in which the greatest need and the best opportunity exists for the most trainees.

The answers to the second and third questions determine the actual detailed content of the training curriculum. For example, a trainee for the personnel and accounting departments would require different schooling than would a trainee for the drilling-operations department.

The foregoing comments seem obvious yet more than one attempt at employe training has not been successful because those responsible for the program have not "thought through" the three points listed and therefore the training offered did not fit the trainee into the organization.

Let it be assumed that the purpose of the business is competitive contract drilling, that the trainee is to be directed through the line drilling organization with the goal of drilling superintendent; that he has little or no field or practical experience and that he is a college graduate in engineering. The training outline listed is designed to fit these assumed conditions. Times given may be varied to suit the specific case.

1. INTERVIEW, HIRING, ASSIGNMENT TO SUPERVISORS—One day:

   Physical exams, personal history and similar matters are taken care of at this time.

2. WORK ON THE DRILLING RIG IN VARIOUS ROUGHNECK JOBS—Eighteen months to two years:

   This is a difficult time for the average graduate not because the work is hard or because of the frequent moves, but because he often has a major adjustment to make to adapt himself to rig personnel. Careful counselling should be given in this period, but the experience must not be made easier for the trainee than it is for regular employes. If the job is made easier, rig personnel resent it and the adaptation problem is all the more difficult for the trainee. Furthermore, by the completion of this period the trainee has experienced a "tempering" process, which is invaluable.

3. ASSIGNMENT TO GENERAL OFFICE—4 to 5 months:

   If the trainee has successfully completed Step 2, his qualities of loyalty and steadiness and his ability to work with field personnel are usually apparent. He will have learned a good deal about his company and its policies; he will have a fair knowledge of day-to-day rig operations. He will have very little knowledge about the business aspects of a drilling operation, or why the company's policies are as they are. Usually, he will not understand the drilling rig as an integrated machine, as a matched group of components, each of which should be balanced with all others.

   The trainee will have developed an intense curiosity about these and many other things and will realize their importance. Accordingly, he is ready for a tour in the general office for he can now understand the relationship between drilling as a business and drilling as an operation. The general office assignment will be divided into work in a number of different phases, as follows:

   a INTRODUCTION TO THE ORGANIZATION—two days:

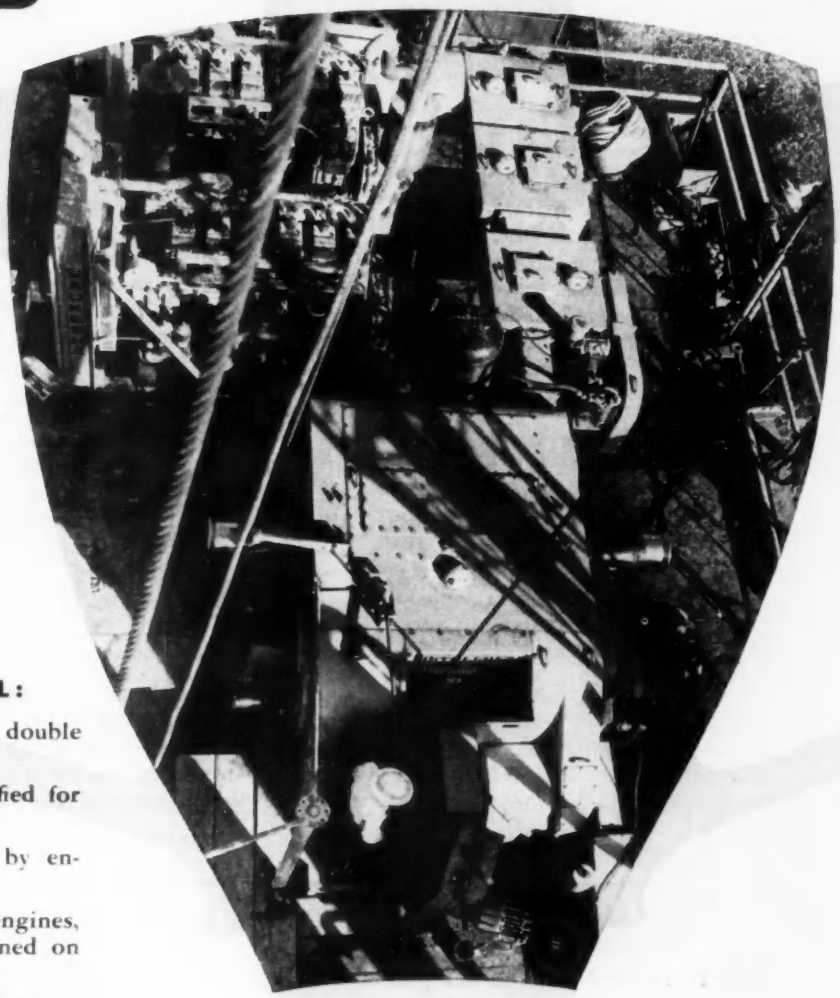
   Every effort is made to enable the trainee to feel at ease, and yet impress him with the company history, its organization chart, its policies and the reasons therefor.

   b PERSONNEL AND SAFETY DEPARTMENT—three days:

   He posts and studies safety records and personnel records and is familiarized with details of the

Bethlehem

M-58 ... It's a Winner!



Where else—in what other rig of its size—will you find so many advanced engineering features? Where will you find such power and flexibility? What other rig of its class can be moved from job to job so easily?

Bethlehem's M-58 is designed for depths from 5000 to 8000 ft with 4½-in. drill pipe. It meets a wider span of drilling conditions than anything we have ever before offered in this size and price range. It's a winner, and it's proved itself on the only true testing grounds—those ornery jobs in the field where every turn of the bit is a fight.

Here on this page we're listing a few of the M-58's most popular features. Study them over; compare them with similar points on competitive rigs. Then call a Bethlehem Supply man and ask for full details and performance records.

IN THE M-58 YOU'LL FIND THEM ALL:

- Two- or three-engine drive with single or double pump drive
- Mechanical drive system that can be modified for fluid drive
- Extra-large, extra-powerful brakes cooled by enclosed circulating water system
- Unitized construction with drawworks, engines, engine compound, and pump drive combined on one common skid
- Engine compound and drawworks transmission clutches of disengaging spline type; master and high- and low-speed drum-drive clutches of extra-high-capacity air friction type
- Disconnecting Airflex clutch-controlled pump drives
- Engine compound of sectionalized type; complete rig can be broken down into loads of required road width

In addition to its manufacturing plants and its sales and engineering service, Bethlehem Supply Company maintains stores throughout the Rocky Mountain, Mid-continent, Southwestern, and California oil fields. There are almost 50 of these modern, up-to-the-minute stores, all fully stocked to meet local requirements.

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General Offices: 21 E. Second St., Tulsa, Okla. *West Coast Headquarters:* Los Angeles, Calif. *Export Distributor:* Bethlehem Steel Export Corporation, 25 Broadway, New York, N. Y. *Canadian Representative:* Rocky Mountain Supply Co., Ltd., Calgary, Alberta.

BETHLEHEM STEEL

various "fringe" benefits the company offers.

c LEGAL DEPARTMENT—15 days:
He is given a brief opportunity to learn about drilling contracts, wage and salary stabilization, insurance, trucking laws and restrictions, workmen's compensation, damage claims, etc.

d GEOLOGICAL DEPARTMENT — 15 days:
He learns how various geological formations affect penetration rates; he learns from electrical logs how and where drill-stem testing is done.

e ACCOUNTING DEPARTMENT—Ten days:
He assists in posting records, trucking reports, material transfers, etc. He learns how payroll time and rig time data are taken from the drilling reports. The trainee is always startled at the high costs involved in delays in drilling and also at costs of transportation.

f TRUCKING DEPARTMENT — Five days:
This brief return to field work is usually appreciated; the trainee acts as a truck swamper and assists in handling materials and rig components. Having previously studied trucking costs, he finds this work interesting.

g DRILLING SUPERVISION AND RIG MAINTENANCE—20 days:
The trainee works as a mechanic's helper for two weeks, thus seeing for himself the effect of any carelessness on the part of drilling crews. Two weeks are spent with the drilling superintendent in his daily duties seeing how telephoned reports become the basis for decisions and how these decisions are translated into actions. *This is the only time in the entire program when the trainee is an observer.* In all other assignments, *he learns to do by doing.*

h DRILLING ENGINEERING — Six weeks:
Most of this time can be profitably used by the trainee in special studies; i.e., wire line, engine, pump, and other cost and performance reports. He should have an opportunity to analyze mud costs and mud control. He will make preliminary cost estimates for bidding on drilling contracts, thus familiarizing himself with drilling rate curves and applying cost information obtained from the accounting department. In this phase of his training, guidance should be general in nature only. He should begin to answer for himself many of the questions he wondered about earlier in his employment. Any and all data he needs are at hand; if not readily available, he has or should have sufficient knowledge of the bookkeeping records to develop the needed information.

Two to two and one-half years are needed to complete the course outlined above. While the progressive contractor never ceases to train his employes, in a sense, the trainee has graduated at the end of this time. Usually, he is returned to drilling operations for a few months roughnecking to "get the feel" of the rig and before long he should become a driller on a light rig. At any rate, from this point, his progress is measured by his own ability to do good work and by his ability to get others to do good work.

Further advancement can be to "big rig" drilling, to tool-pusher or drilling engineer, to district superintendent, to assistant general superintendent and to general drilling superintendent; this latter position being one of great responsibility and providing the recognition which is one of the basic human needs. The man holding this job is directly responsible for the efficient, safe handling of perhaps several hundred employes. Somehow, the general superintendent must be able to transmit some of his own knowledge, experience and loyalty through the supervisory line down to the new roughneck or engineer trainee. Naturally, he uses the safety and personnel departments to help in this effort, but in the final analysis the drilling organization is a projection of the general superintendent's personality.

Deficiencies Noted

At the beginning of this article it was observed that the training program must attempt to fill in those gaps which the trainee's previous experience and education had missed, or in which they had been inadequate. It will be found in most cases that the engineering graduate is deficient in two respects: First, he knows little or nothing about the details of drilling operations, and he must learn these details by actually doing them; otherwise, he can never be a *safe* supervisor, if not an efficient one. Second: *he must learn to work with people.* This is the most valuable lesson learned on the rig, for all business is transacted through and with people. A few specialists, a limited number of scientists, can minimize the human equation but by and large the man most skillful in handling his relations with his boss, his fellow employes and with those he supervises will go the farthest. These two reasons necessitate considerable training on the rig floor.

On-the-rig-training is not enough, however. The general office training must be given more or less as outlined. Experience has proven that this general office tour is most effective when given after the field experience, rather than before the field experience. Otherwise, the trainee misses much of the value of the office period.

About the Author

JACK H. ABERNATHY, vice president of Big Chief Drilling Company, Oklahoma City, was graduated from the University of Oklahoma in 1932 with a B.S. degree in petroleum engineering. He was a petroleum engineer and later chief engineer for Sunray Oil Corporation in Tulsa, and in May, 1941, became chief engineer for Superior Oil Corporation, also in Tulsa. In August, 1942, he was appointed chief engineer and chairman of engineering committee for the Oklahoma City Wilcox Pool Engineering Association. Upon completion of the engineering and reservoir study of the Oklahoma City Wilcox Pool, he returned to Sunray Oil Corporation, Tulsa, as assistant general production superintendent. He has been active in the work of the American Petroleum Institute for many years and is presently a member of the General Committee of the Division of Production. He is the author of a number of published articles on various phases of petroleum engineering and drilling industry operations and economics and is serving as National Chairman of the Educational and Research Committee of the American Association of Oilwell Drilling Contractors.

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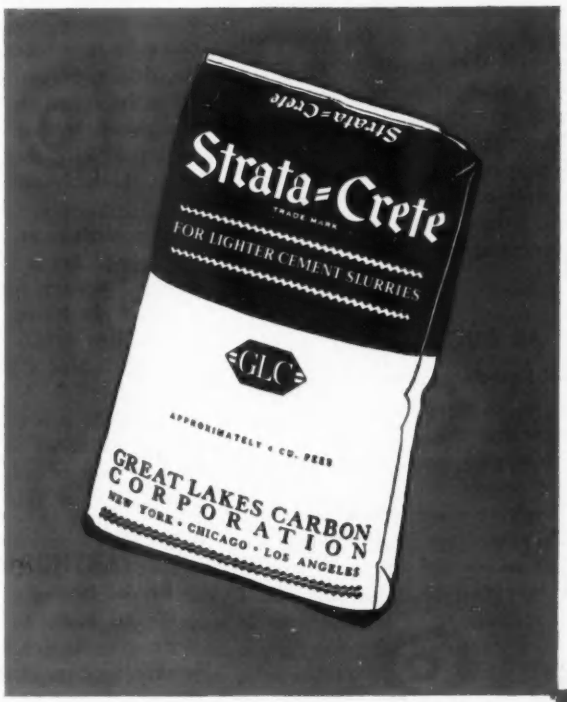

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'Ex-Roughneck Has a Point'

Contractors, Drilling Foreman Reply to Suggestions On Bettering Labor Relations With Men on Rig

THE Roughneck had some good points . . ."
"I take issue . . ."
"It is well to discuss the complaints . . ."

These were among comments received on "The Roughneck's Side," an article in the July 1 issue, in which an ex-roughneck presented his ideas on how drilling contractors can improve relations with the men working for them.

In order to offer both sides of the question, WORLD OIL asked several contractors and drilling superintendents to answer the ex-roughneck. Here are excerpts from their letters.

R. J. WOLFE

The Grey Wolf Drilling Company, Houston

I have been giving some thought to the situation of a roughneck in relation to his own welfare. This thought is not new to me, as I have had the problem of the roughneck under consideration for many years and have given a great deal of thought to his welfare and as to ways in which he could be given a better break and at the same time improve the position of his employer; the two problems being interwoven very closely—interwoven so closely that it is not possible to separate them.

I do think that his point about the use of his own car in going to work is well taken since the roads to the ordinary drilling well are not such as to lighten the upkeep on a car. There should be some way of helping him here. Then, his point about housing is one to which we have given a great deal of thought. Many of our men have bought trailers with or without our help. Of course, the solution to this problem is in consecutive work so that the moves will be minimized. This is the dream of every drilling contractor and one which very few ever realize.

The only hope I can see for a roughneck is to settle in an area where there is likelihood of considerable work and work for whoever is drilling in that area. Nowadays, probably 30 percent of the roughnecks move with the rigs; the others work for whatever contractor is operating nearest to them.

One of the worst things to ever happen to the oil field roughneck is the 40-hour work week. His pay should be prorated over the full seven days and if he loses one day he should not lose his overtime.

Working in the oil field requires good, tough men and they should be paid premium wages in relation to other work, much higher than they are drawing at present. There is no way for the drilling contractor to pay higher wages under the present highly competitive drilling setup where there is more than one rig waiting for each contract.

•

AL BUCHANAN

Oil Operator, San Antonio

Whoever wrote this has some very good points. Regarding the roughnecks having to move, sometimes every 30 or 40 days, and costing around $100, when if they had the money to make a down payment on a trailer house they could move much cheaper, but unless the contractor would lend the money they could not buy one. I am doing that very thing to some reliable men who have been with the company a long time, but I can't do it promiscuously, as a lot of them would run off with the house and never pay you back, or you get out of work yourself and they could not pay you then. But I do help the boys who have been with me a long time.

The next item is in regard to transportation to and from the job. Due to the Wage and Hour Board holding that if an employer furnishes transportation he has to pay the men from the time they left their homes or wherever they are staying, full time to and from the job, which of course will use up their 40 hours in half the time that it would otherwise, and throw them overtime, and we can't afford to do that. So we pay the driller or roughneck so much a day for use of their cars and take it out of the men's paychecks.

Regarding the paragraph on going outside and hiring drillers and toolpushers in place of making them out of your own organization—we do very little of that, but sometimes we have to because some roughnecks don't make good drillers and some drillers don't make good toolpushers. And, too, the contractor who has a number of rigs shut down then gets a rush order to open up again, hires men wherever he can get them. I do everything I can to encourage men to do a good job, learn the business and get ahead, which is not condoned by the union, but that is one thing I have always done. I promote a man on his ability regardless of his seniority, which the union does not believe in, either. I believe in everyone being equal, but I don't believe it right to have some deadhead not getting along like he should, get a better job than some young (and I mean by young in the length of time he has been in employment) man that is trying hard to get along. The best man always gets the job regardless of how long he has worked in my company.

Regarding toolpushers telling men what to do without consulting the driller: We don't do that where it will interfere with the driller or his work. And as for who hires the men, we make it a rule for the toolpusher to hire the driller and the driller to hire the roughneck, but sometimes the toolpusher hires the roughnecks, too.

In regards to an organization where one driller will fire a roughneck because of a personal matter, we have no objection to someone else hiring him, providing he does not steal or drink. We wouldn't want him on any kind of a job under those circumstances.

All in all, it is an interesting article and he has a number of good points. As I said before, most of them we have been practicing for some time.

•

ARTHUR P. BUZZINI

Buzzini Drilling Company, San Antonio

We all know a roughneck needs a car to drive to his job, but so does an aircraft worker, and he has to drive to his job through heavy traffic. In most instances, the roughneck also is paid comparatively better wages to make up for these costs. I have also seen lots of jobs, and so have you, where he, too, can walk to work, which is a rarity now in this country.

I agree with the roughneck about safety programs in that talk is not as important as action. What the roughneck does not say is that safety is more his job than it is the boss's as safety on the drilling rig is the same as safety on the highway. Accidents are mainly caused by car drivers and not the manufacturers or the owners.

Even though I don't agree with some of the roughnecks points, I believe it is well to discuss all the complaints. We might find one point which would be important to us.

•

M. L. CLAYTON

Senior Drilling Foreman, Shell Oil Company, New Orleans

I have roughnecked, drilled, pushed tools and am now a senior drilling foreman and, if I had it to do over again, I wouldn't change with the exception of the fact that I would have tried to pick up more knowledge in my younger days and made more effort to get along with the men around me and the people I work for.

All jobs or professions have their drawbacks and any man can probably recite a list of factors that he deems makes his

profession a bad occupation to be in. Griping is an oil field pastime.

I take issue with the "Ex-Roughneck" on the last part of his story. If crew members are the "boom" type and quit when the going occasionally gets rough, and the "despotic" contractor or pusher calls upon them to make a whole round trip during a tour, then the contractor can be expected to go outside his own organization to hire key men who will get the job done. My experience has been that if a man tries and makes an honest effort to learn the business, is interested in his job, tries to see both sides of instructions and orders, gets along with his fellow workers and is otherwise qualified, he will not be overlooked when the time comes for advancement. Any crew that walks off just because they have to make a round trip during a tour should keep on walking—completely out of the oil field.

I grant that ordinarily the pusher should issue instructions to the driller but I do not think this is a hard and fast necessity. There must have been very little understanding between the pusher and driller in the case where a pusher sent part of the crew off when the driller had a dull bit on bottom. The driller certainly didn't know what was going on around the rig and, after all, why didn't he send the men to look for leaks in the water line, if a situation existed that was serious enough to try to find the source. There are some drillers whose ability only consists of being able to "clutch" a rig and slack off. They would get along better if they themselves found the leaks in the water line for after all a pusher's job is not always a bed of roses.

If personal differences occur between a crew member and pusher—this is a hard nut to handle—I would go along with one transfer—but, if the second time came up, there would be some room for doubt in my mind just who was at fault.

The driller was not such good material when he casually dismisses the safety program. He again mentions the patched-up walk. We see too many rig crew safety meeting reports come in that recommend repair of a walk or runway when the driller should have gone ahead and made repairs and not allow such reports to show up on a safety meeting form. Too often the missing swing in a line or the missing board in a walk is on the job and the pusher has to point them out and sometimes insist that the crews properly assemble the equipment.

This is not written in an argumentative frame of mind. Most all questions have two sides and the more each party attempts to see the other man's viewpoint the smoother the result. After all, a toolpusher has to be a "jack of all trades" today, and the handling of personnel problems is one of his biggest headaches.

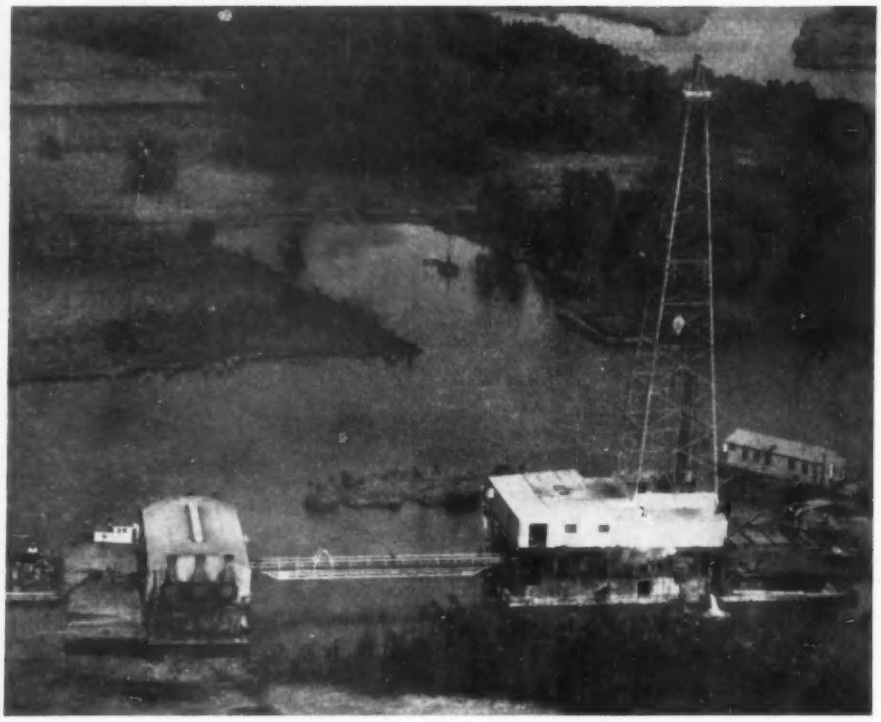
Crane Move Saves Ten Days

How to Drill Five Instead of Four Wells a Year

HOW to drill five instead of four wells per year? This money making answer can be seen in the accompanying photograph where a 136-foot derrick, complete with a 14-foot substructure was moved two miles in 2½ hours. Scene of action was the Bayou Boutte field, Duck Lake area, in the vicinity of Morgan City, Louisiana.

Moved for The Ohio Oil Company, the derrick included the complete component of crown block, traveling equipment, rotary table, drawworks, sand reel and miscellaneous floor equipment.

It is estimated that ten days downtime was saved, since it was not necessary to disassemble the derrick and substructure and reassemble at the new location. As of the date that drilling would have normaly been resumed after moving the rig, the operators were drilling at 5600 feet. On this basis, it is now expected that a rig that would normally drill four wells per year will now be able to drill five at the same cost.



Rowan plays it safe by using six-man crews for barge operations such as this steam rig at Venice, La.

Proof of Program Is in Performance And Here's a Firm That's Proving the Stable Employe Is The Safe Employe

By AL REESE
WORLD OIL Staff

Rowan Keeps Them Happy and Safe

HAPPY employes don't often get hurt.

Proof of this is in the safety record of Rowan Drilling Company and Rowan Oil Company of Fort Worth, which are using the weight of an expanding personnel program to push down their accident frequency rate.

Of the 60 accidents that befell Rowan employes during the first quarter of this year, only four involved workers who had been with the companies five years or longer. There were 13 accidents involving personnel who had been with Rowan from 1 to 5 years; 6 accidents among those with service of six months to a year; and 37 accidents among those with less than six months' service.

The conclusion, believes Rowan, is obvious: The happy employe is stable and the stable employe is safer.

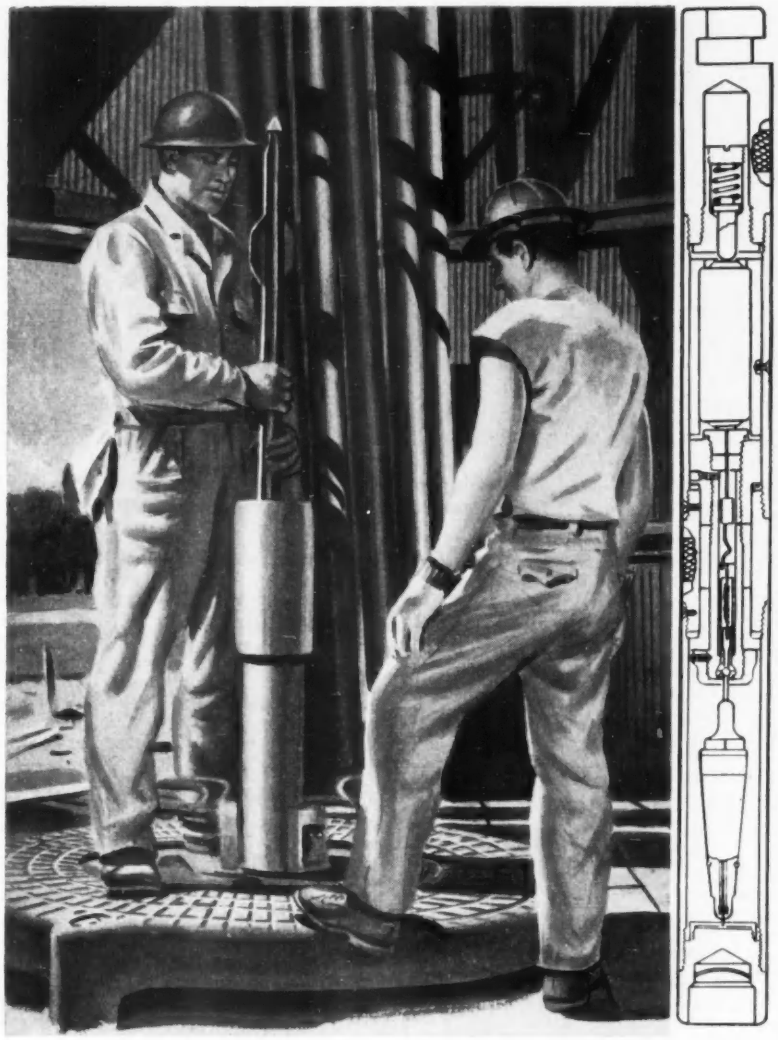
Because of this belief that stability and safety are inseparable, safety is woven through the pattern of Rowan's personnel program, though without being overemphasized to the detriment of other projects. It is one phase of a master plan which holds that a company can survive in this extremely competitive industry only if it attracts and retains good employes.

RESPECT your equipment
OFFER suggestions for improvement
WATCH out for dangerous habits
AID new men whenever possible
NO accident is ever necessary

This device for keeping Rowan personnel safety conscious won a cash-for-ideas award. Initial letters R-O-W-A-N are red and others black. It will be attached to machinery, bulletin boards, vehicles and other places as a reminder to employes.

Safety at Rowan is recognized in the job application blank; it can take away from or add to an employe's paycheck; it can get him promoted, laid off or dismissed; and if he leaves Rowan and desires to return at some future date, it can aid him or bar him through Termination of Employment records kept on all departing employes.

Such an interlocking personnel-safety program demands an equally interlocked administrative personnel and it also demands that these officers have the authority to enforce Rowan's



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The record is made by small electrical current which makes a dot on the recording disc only when the E-C is at rest. To double-check with an E-C, just raise it a few feet and again lower it to the previous depth. In this way you check for movement of the instrument and alignment of the axis of the instrument with the axis of the drill collar. Your reading's accuracy is then checked and double-checked.

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Philadelphia, Pa. Falfurrias, Odessa, Marshall, Texas Long Beach, Ventura, Bakersfield, Calif.
Oklahoma City, Okla. Lafayette, La. Moulden Oil Field Services, Casper, Wyo. Crossville, Illinois

LEFT. Dan A Nolte, extreme right, is one beneficiary of Rowan training program, aimed at raising educational standard by bringing in promising youths. Nolte was sixth man on drilling crew under 28-day training plan. Since he was not competing with other men for jobs and was not drawing same pay, they were more eager to help him learn. As a result, he took on full duties of a roughneck within two weeks. After becoming thoroughly familiar with oil field work, he was shifted to home office and is now assistant safety director and co-editor of Rowan's magazines. Others in picture are, left to right: R. S. Hokett, R. L. Huggins, R. L. Robinson, driller, and G. E. Hackney.

RIGHT. Men at work. The best safety records are made with the best tools, Rowan believes.

safety principles. At Rowan, there is only a single door, frequently ajar, between the offices of John S. Jackson, the director of safety, and Mark Hart, vice president in charge of Personnel, Payroll, Safety and Insurance departments. The vice presidency was recently settled on Hart for the double purpose of rewarding his 15 years of profitable efforts for Rowan and to emphasize the importance with which management regards the personnel and safety program. This emphasis is repeated by the fact that the safety director has the authority to shut down a rig if he finds it unsafe.

Unique Application

It is Hart who devised the application for employment, which is every prospective employe's introduction to the fact that safety, as Rowan sees it, is not a matter of idle preachment but of hard practice. Recalling his sweaty struggles with lengthy application blanks in his pre-Rowan days, Hart has limited the Rowan form to a single sheet, with one side devoted to the application and the other to a detailed physical report which may give an insight to the applicant's past safety habits.

Thereafter, the employe's record is maintained on another streamlined form which has a prominent space for Lost-Time Accidents. The worker's safety record is also reflected under Performance on Present Job. Under this space can be found occasional notations like this: "Laid off without pay for sliding down drill line rather than climbing down ladder."

These inerasible little smears on an employe's record are considered on each anniversary date of his employment, when his record is reviewed by a group of three of his supervisors. The supervisors weigh and note on the card his Knowledge of Present Job, Ability to Plan and Understand Work, and his Personal Qualities in making these annual ratings which are the key to promotions.

More detailed records are kept by Jackson for the two-fold purpose of maintaining individual safety standings and of ferreting out, and removing, the causes of accidents. This file tells who was hurt, what part of the body was hurt, what tools hurt him, and how long the employe has been on the job. With these data the safety department is constantly forewarned of which workers will most likely be injured and in what manner.

To assure the accuracy of the records, every lost-time accident is investigated by a committee consisting of the driller, the drilling superintendent, division drilling superintendent, safety director, the injured man and a witness to the mishap. This committee determines how the worker was injured, reports on how the accident could have been avoided, and recommends penalties, either against the worker or his supervisor, if warranted.

These men run Rowan safety program. Left, Mark Hart, vice president of Personnel, Payroll, Safety and Insurance departments. Right, John S. Jackson, safety director.

Details Not Overlooked

Even more important than the deterrent to unsafe practices is the encouragement of safe practices.

This is accomplished in large measure by common-sense attention to details, such as daily inspection of tools, six-man crews in unusual working conditions like barge drilling or winter operations in North Dakota, and a plan that allows employes to buy safety shoes at cost through payroll deductions.

Great emphasis is placed on 15-minute safety meetings held each week on every rig. These sessions are led by the driller or superintendent, who each week selects a safety subject for the following meeting and appoints a reporter. It is the latter's duty to keep the bulletin board up to date, to note unsafe practices or equipment, and to seek the crew's recommendations for improving working procedure or equipment. This information goes on a form and is submitted to the

Drilling superintendents of each division were called together recently and given course in supervisory training and conference technique.

driller or superintendent to be signed and sent to the safety director.

The value of these meetings is being enhanced as the Rowan organization feels the full effects of a course in conference technique and fundamentals of supervision, recently taught by M. L. Powers of the Division of Engineering and Industrial Extension, Oklahoma A. and M. College. Designed to bolster many phases of the personnel program, safety being one, the course was given first to a group which included top management. Conference leaders were then named from this group to teach the course in six meetings of four hours each throughout Rowan's three divisions.

Bulwark of Program

A bulwark of the safety program is the Rowan *Safety Bulletin*, a monthly periodical which purposely offers a contrast to its big-sister publication, *The Grapevine*, a bi-monthly. *The Grapevine's* purpose is to spread family friendship with cozy chatter about anniversaries and promotions and smiling photos of babies and brides. The *Safety Bulletin* is the mouthpiece of the safety director, and he seldom sweetens his words.

Whereas *The Grapevine* recently bragged that 15 drillers had won wrist watches for completing 2000 hours during 1951 without injury to themselves or their crews, the *Bulletin* offered a terse record of all the drillers' safety records, the good and bad alike, with the invitation to "Check Your Standing as a Safe Driller."

The *Bulletin's* province is safety at home and on the highway as well as on the job, and it does not hesitate to lecture on careful driving, to give a lesson on operating power lawnmowers, or to remind that first aid kits should be checked with regularity. However, its principal function is to record the safety meetings and to describe the accidents for the previous month and to detail how they could have been avoided.

The Rowan publications are examples of what can be achieved through proper employe incentive backed by management cooperation. Both are the result of part-time efforts. The news items are furnished by field personnel. Co-editors are Dan A. Nolte, who is also assistant to the safety director, and Thomas Nichols, a geologist. The feature editor is Katherine Smith, secretary to C. L. Rowan. The photographer is Jackson.

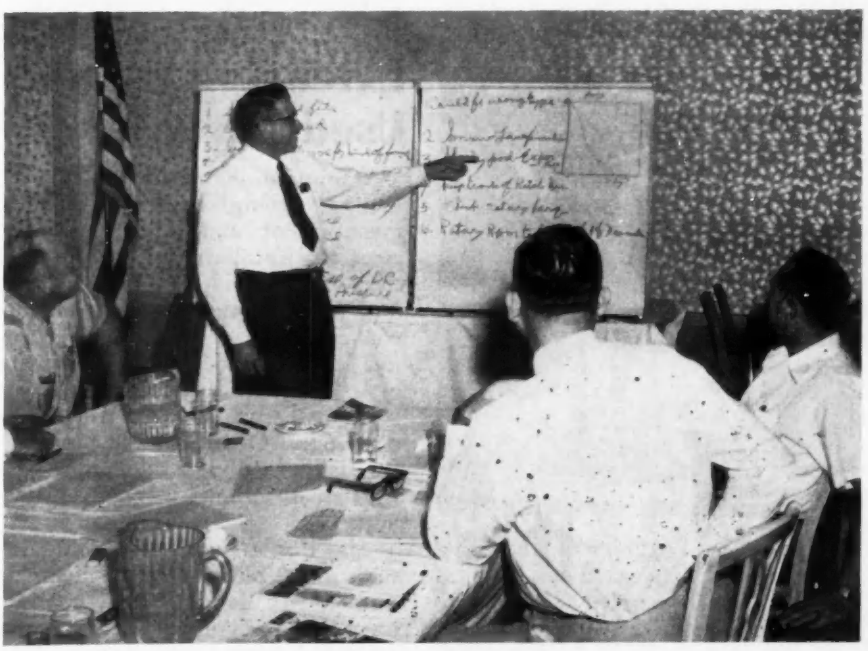
Under the direction of Hart and Hamilton Rogers, attorney in charge of the Land-Lease department, the companies recently brought out a handsome handbook, "Getting Acquainted with Rowan," and are now preparing a "Driller's Book" which will detail for drillers and superintendents their responsibilities to their companies and to their men.

Other Vital Factors

This is the hard core of the Rowan safety program, but there are other vital factors in the successful effort to keep employes happy, hence stable, and therefore safe.

Among these are paid vacations ranging up to four weeks for field and office personnel alike, cash for ideas, a payroll savings plan, service pins, Christmas bonuses, re-employment of veterans, accredited service benefits, group insurance paid largely by the companies, and a wage scale that compares favorably with any in the industry.

Rowan believes that any happy employe will heed the admonition of the late Elbert Hubbard, printed on the back cover of the handbook: "If you work for a man, in heaven's name work for him; speak well of him and stand by the institution he represents . . ."



Ira French, Rowan drilling superintendent, conducts a course in supervisory training.

How to do it!

DRILLING HINTS

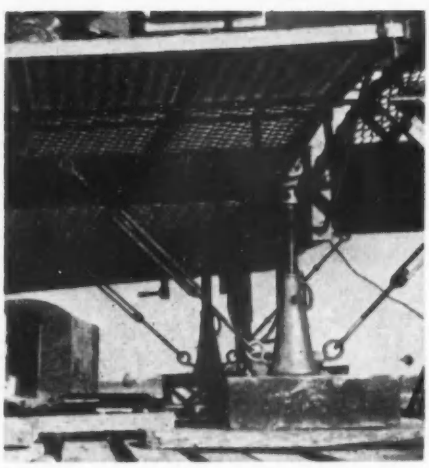
$10 is paid for each illustrated acceptable contribution. Mail to The Editor, WORLD OIL, P. O. Box 2608, Houston 1, Texas

Hinged Jack Aids Quick Rig Setup

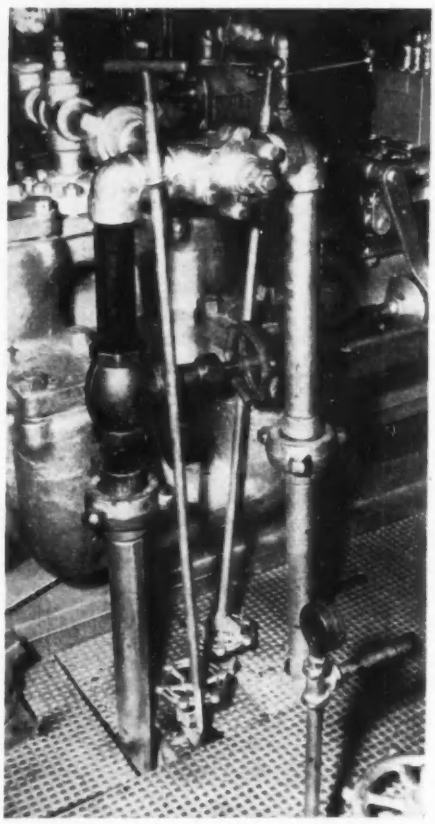
On portable rigs a simple method of blocking and leveling the front of the trailer is to attach screw jacks to the frame of the unit so that the jacks can be swung back and tied when the rig is in travel position.

A clevis and pin arrangement is made by welding a clevis to the rig frame on either side. The tops of the jacks are then fitted with blocks perforated to match the holes in the clevises. After the jacks are attached and extended to the blocks and the frame leveled, braces are put on either side by means of turnbuckles. The turnbuckles are attached by welding eyes to the bottom of the frame and inserting eyes in the sides of the jacks by means of threaded connections. The turnbuckles are hooked between these eyes and taken up sufficiently to make a steady support.

When it is necessary to move the rig, the turnbuckles are disconnected from the jacks and laid back along the bed of the rig. The jacks themselves are then taken up and swung



back and hooked out of the way. When the rig is spotted on the new location, it is merely necessary to place the blocking, swing down the jacks, run them out and fasten the turnbuckle frames in position.



Extension Handle Used for Safety

Manipulating control valves, particularly around steam pipes, is often inconvenient and dangerous. However, the installation of anchored extension rods will remove the hazard and place valve controls in a more convenient spot.

The illustrated valves are a part of a boiler feed system and require constant adjustment during firing operations. Of course, the position of the valve wheel, aside from being near steam piping, is inconvenient to adjust.

The iron rod extensions are fitted with metal plate wheel engagers and welded rod handles. The extensions are kept in alignment with one-quarter inch rod loops passed over the rods and welded to connections nearby.

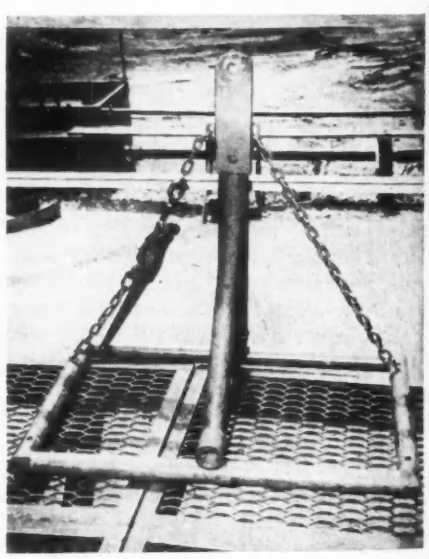
Collapsible Rack Holds Wire Line

A portable, collapsible rack can be used to advantage for securely supporting a wire measuring line. Primarily designed for shallow hole operation where light-weight reels are used, the device can be bolted to the floor to insure operating stability.

The base is made of welded sections of two-inch pipe. Two-and-one-half inch pipe sleeves are welded in the center of each side to permit dropping the vertical support. The three inch vertical support is horizontally and diagonally braced with two-inch pipe nipples. A plate metal spool adapter is welded to the upper section of the vertical support.

A retainer chain is attached to the right side of the unit while the left chain is rigged with a boom for tightening the vertical support in perfect alignment.

In use, the unit is bolted to the



floor near the drawworks cathead. Then, with the vertical support in a horizontal position, the reel is engaged, the support lifted and the boom locked to secure the support.

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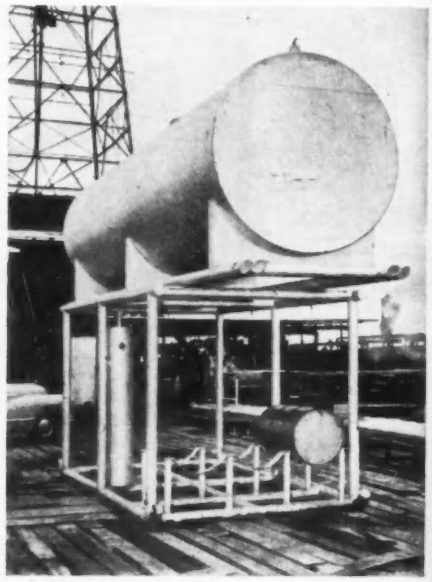
Holder Helps in Fire Prevention

Fire prevention measures are especially important because of inflammable materials used around a rig. For this reason numerous fire extinguishers are placed in conspicuous places on location.

However, if these fire extinguishers are not well secured they may become misplaced. The illustrated holder can be made easily with two pieces of scrap iron and a little welding. A short piece of eight-inch pipe is welded to a base of quarter-inch sheet metal and the complete unit is secured to the rig.



Lube Drums Stay Under Fuel Tank

Supports for elevated fuel water tanks serve the triple purpose of elevating the tank, racking lube drums and housing a gas volume system. The simple support construction consists of welded three-inch pipe lengths. The lube racks, made of comparable size pipe, are welded to the base reinforcing system. Formed and welded strap metal extends from leg to leg to make a shaped support for lube drums.

The gas volume-scrubber chamber is made of welded casing sections with inside piping designed to bubble the fuel up through scrubbing solutions. Welded to one leg of the tank sup-

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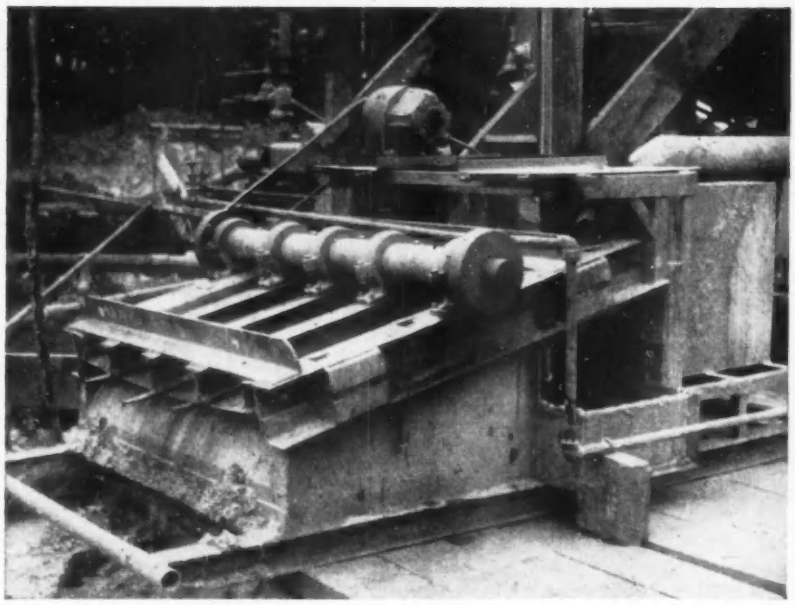

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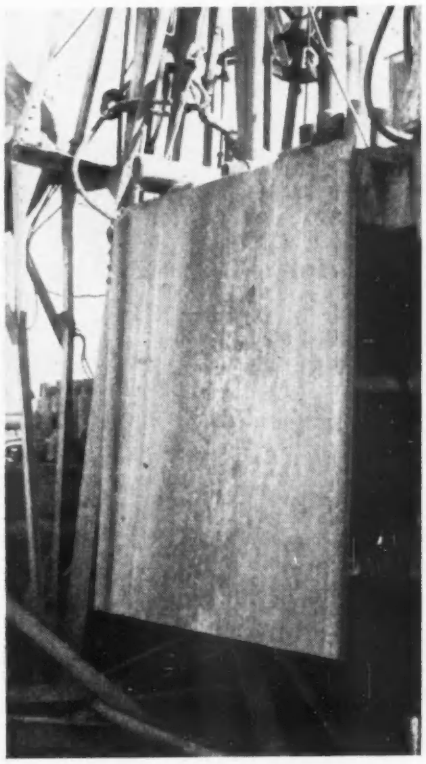
port, this scrubber system is used when gas rather than diesel fuel is required for engine operation. When gas is used, water may be stored in the large diesel fuel tank.



Hinged Ramp for Loading Trucks

When heavy equipment is to be transferred from a truck to the derrick floor, only one move is necessary when a hinged ramp is attached to the floor. The ramp is made of tank steel welded to a substantial angle iron frame which is anchored atop one derrick sill with heavy duty hinges.

As shown in the illustration, the ramp hangs straight down against the substructure when not in use. For loading, the derrick line can be fastened to either side of the open end guard rail to lift the outer end of the ramp to clear the body of the truck. After the truck is spotted, the ramp is lowered and loading or unloading is done without difficulty.

Although an inexpensive addition to a drilling rig, this swinging ramp lightens trucking requirements for moves and, at the same time, provides a convenient, rugged surface for handling equipment from the truck bed to the derrick floor.

RBC's

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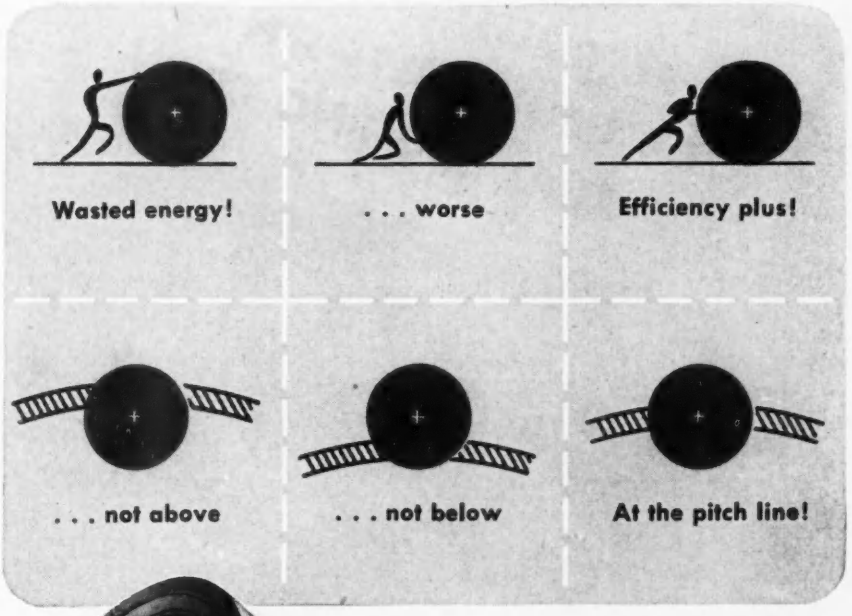

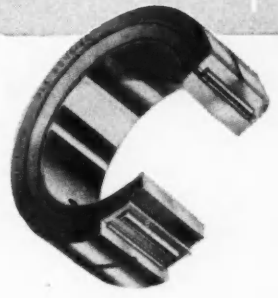

• Aligned at the *pitch circle*, the most efficient plane for roller guidance, PITCHLIGN rollers are not subject to the internal stresses incurred in other bearings where the cage acts at a point above or below, the pitch circle. In PITCHLIGN bearings, tangential forces are virtually eliminated, since the cage acts *only* in the direction of rotation and at a point coincident with the roller orbit.

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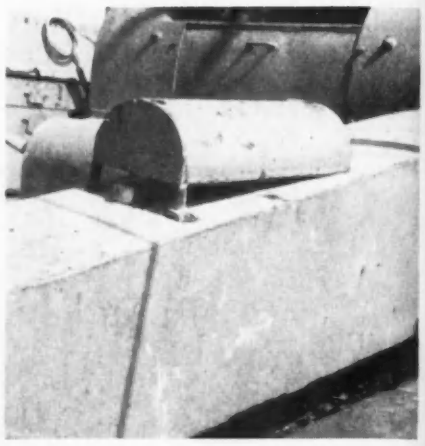
Simple Lubricator Oils Rotary Chain

Where the rotary table is driven from the drawworks, it is usually difficult to keep the chain properly oiled. One company made an oil container from a section of 12-inch pipe cut down the middle with a plate welded across the bottom and ends. Legs were put on one end as shown to make it level on the top of the rotary chain housing.

A filler connection was then made on top and a collar and petcock inserted in the bottom over a hole cut in the top of the rotary chain housing. The container is filled at the beginning of every tour and the petcock



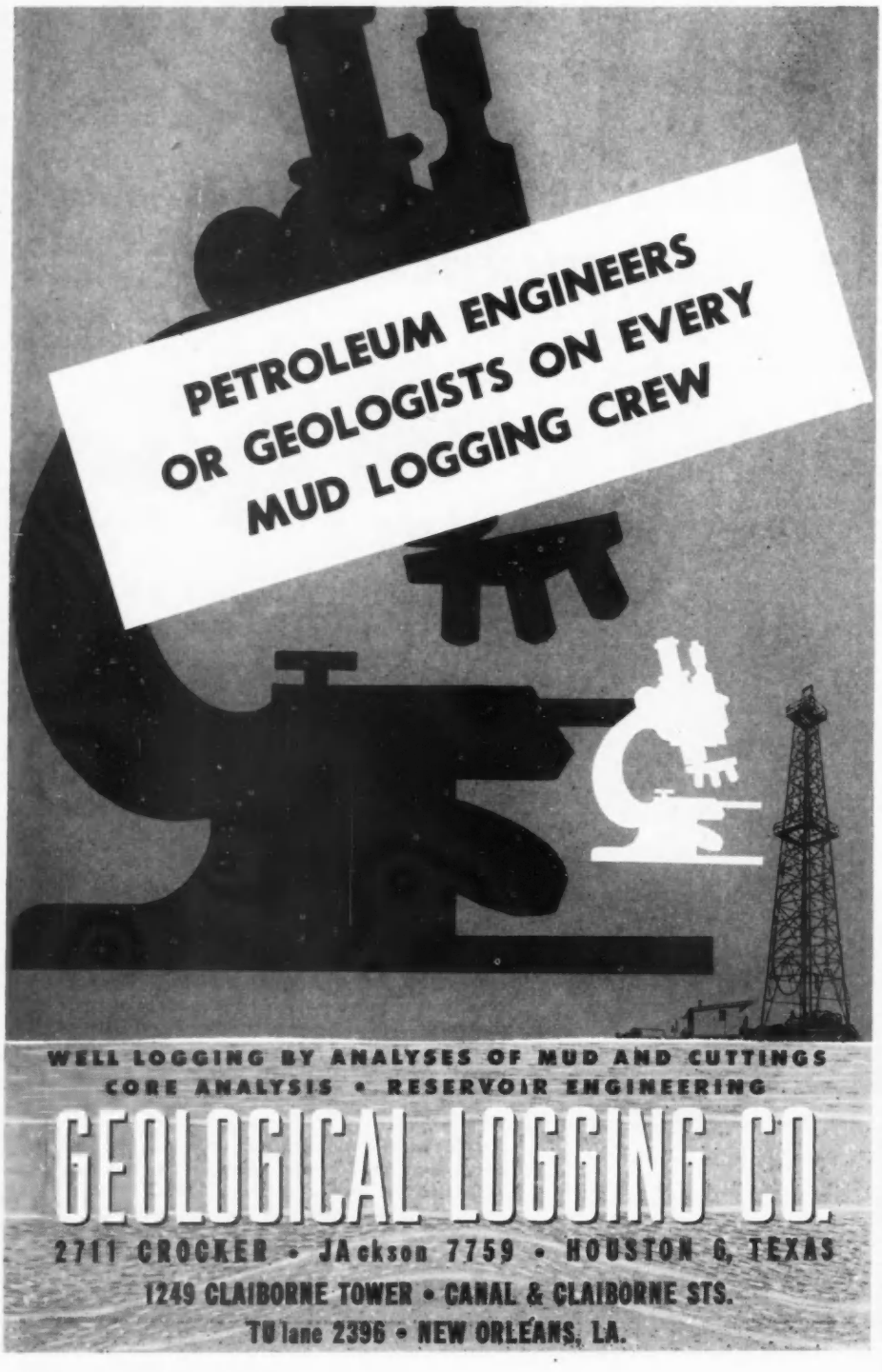
set to make a steady oil drip on the rotary chain. Clean used oil from the diesel engines is satisfactory to lubricate the chain.

By using this simple device, the life of the rotary chain may be trebled and, of course, a lot of down time saved.

Keep Light Handy For Emergencies

A welded stand is valuable for emergency lighting around a rig. The illustrated stand is made with two three-inch split pipe sections which serve as the base. Another three-inch extension is fastened at the base middle to act as the lamp post. Four diagonal two-inch braces provide added rigidity.

The light is attached to the post with an adjustable metal yoke. This heavy duty, durable unit will support a large flood light capable of illuminating a wide area around the rig.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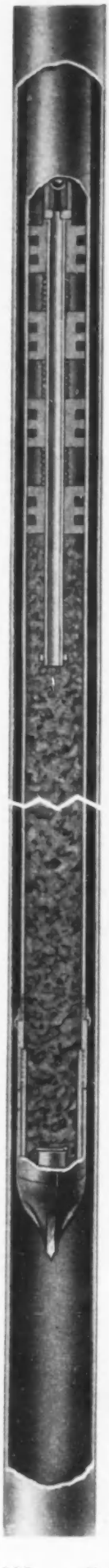

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Auxiliary System Removes Exhaust

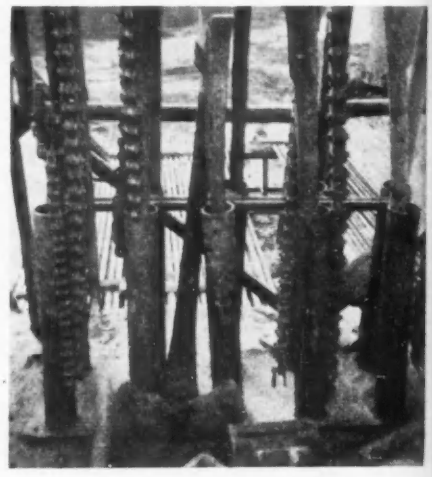
As a safeguard against the possibility of fire when a well is being brought in, or when wash oils are being used, one contractor makes it a practice to switch the engine exhaust into an auxiliary exhaust system that takes the gases some distance to the rear of the rig.

In the installation pictured, the auxiliary system consists of a pair of six-inch lines, supported at the outer end by A-frames made of two-inch pipe. Two vertical mufflers, 30 inches long, are screwed into three-inch collars welded into the end of each line. The mufflers are 12 inches in diameter and are equipped with water circulating fittings for use if further cooling is desired. The muffler units are installed on a short, separate section of six-inch pipe which is flanged to the main exhaust line for ease of rigging-up and transporting.

Tools Are Handy, Workmen Safer

A unique tool rack for chain tools, crow bars, etc., can be made easily by welding several lengths of pipe to a base plate and to a center bar as illustrated.

This rack not only promotes good housekeeping and safety by keeping tools off the floor, but permits the whereabouts of the tools always to be known.



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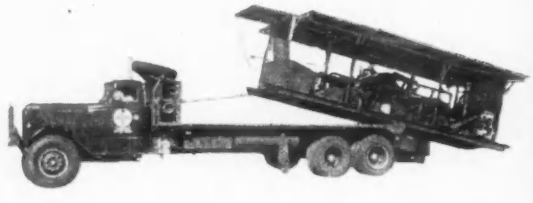

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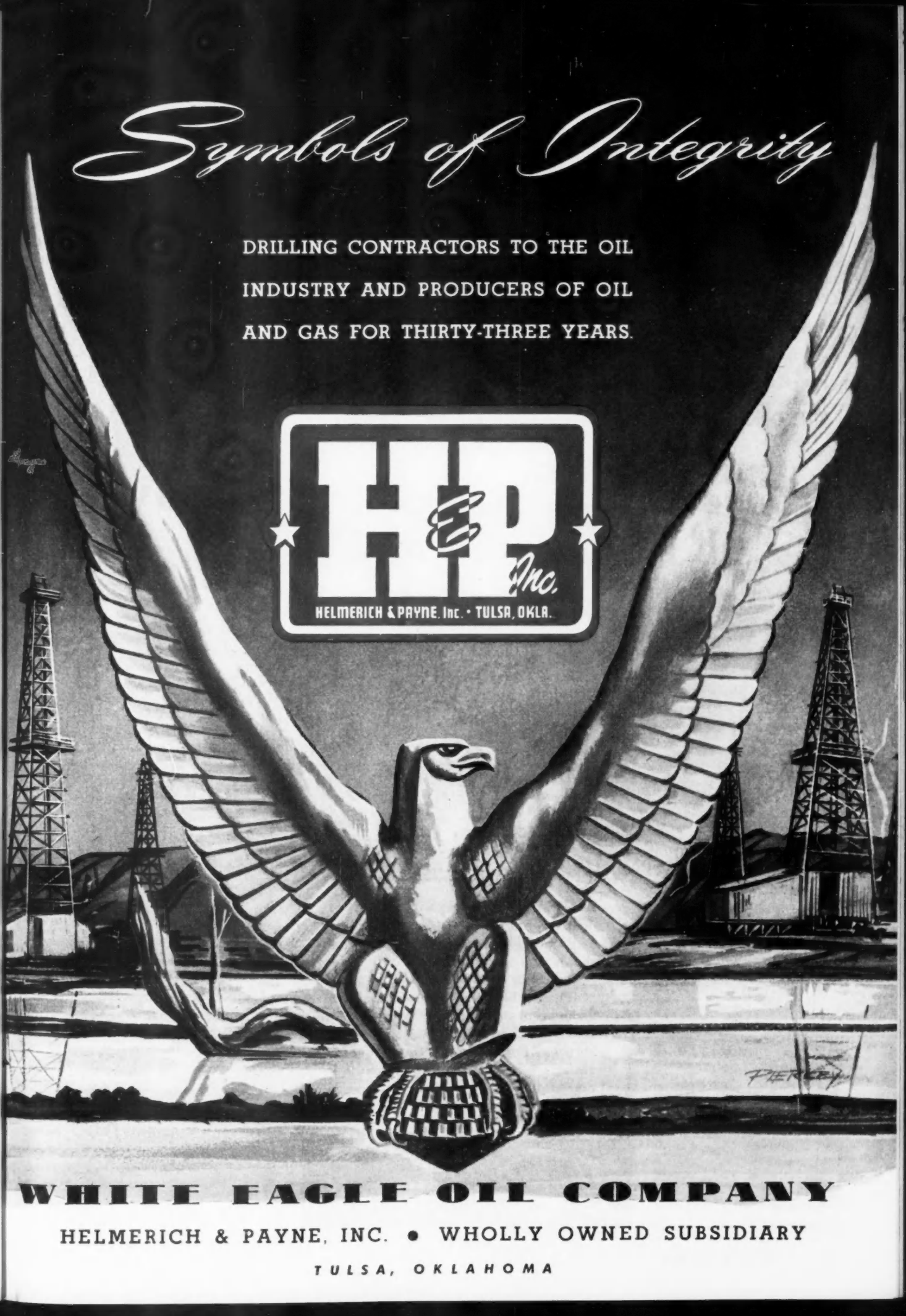
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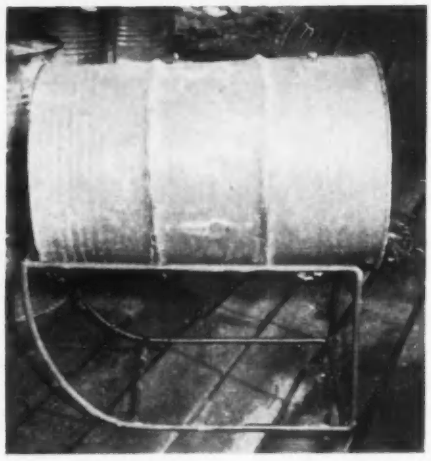
Rocker Handles Big Lube Drum



Discarded sucker rods are useful in fabricating a simple, inexpensive and easily managed lube drum rack. The two lower runners are heated and bent in the illustrated manner while another rod section is bent at a 90-degree angle to form the upper drum rest. Welding these two sections together forms the sides of the drum rack.

Four spacer bars are formed and cut in a manner to make the rack width slightly less than the over-all drum diameter. Welding the rod dividers to the side members as shown completes the rack.

When loading a fresh drum of lube on the rack, the drum is tilted to permit sliding the upper left hand rod of the rack beneath one edge. Then the drum is allowed to drop back to the ground, locking the rack up close to its side. From this point, putting the drum in a horizontal position merely involves forcing it toward the rocker skids. With little effort, the drum will rock into place.

To keep the drum from moving off the rack while it is being positioned operation, a strap iron device at the spigot end is used to clamp the drum to the rack before it is tipped to horizontal.

Unitizing Racks Speeds Rig Move

On a light drilling rig, where the pipe is racked on timbers placed at ground level, one drilling contractor has cut moving time and otherwise simplified handling of the walkway by unitizing it as shown.

The 3 x 12 planks were placed side by side, then bolted to short cross pieces of the same material. The cross pieces are spaced so that a slot is formed to fit over 8 x 8 or 10 x 10 timbers on the ground. At intervals, and bolted to the under side of one edge of the walk, are heavy steel rings which make it easy to attach slings to hoist the walkway.

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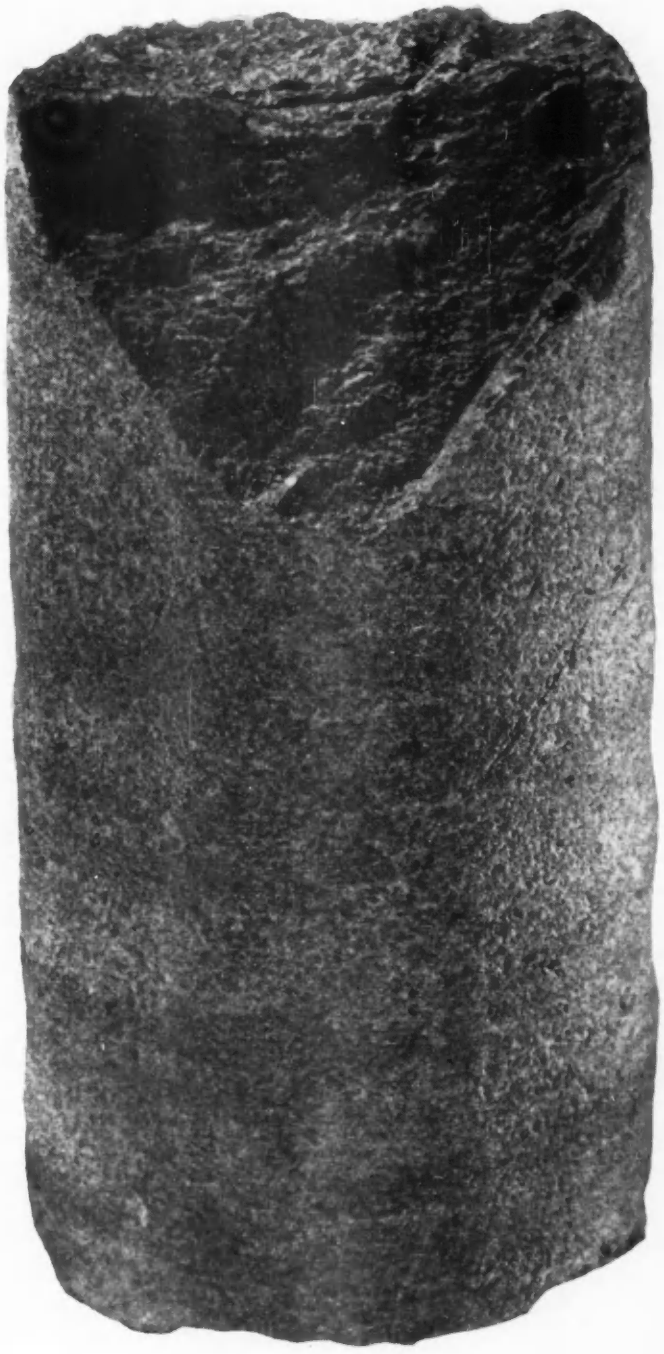

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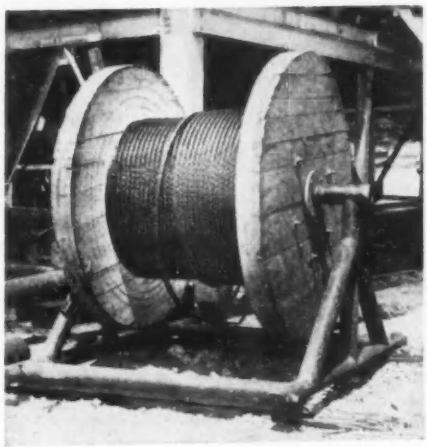

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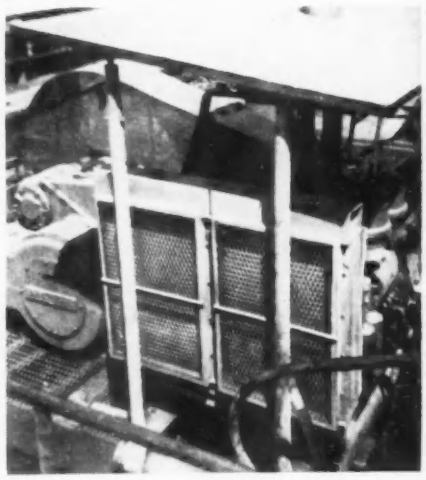

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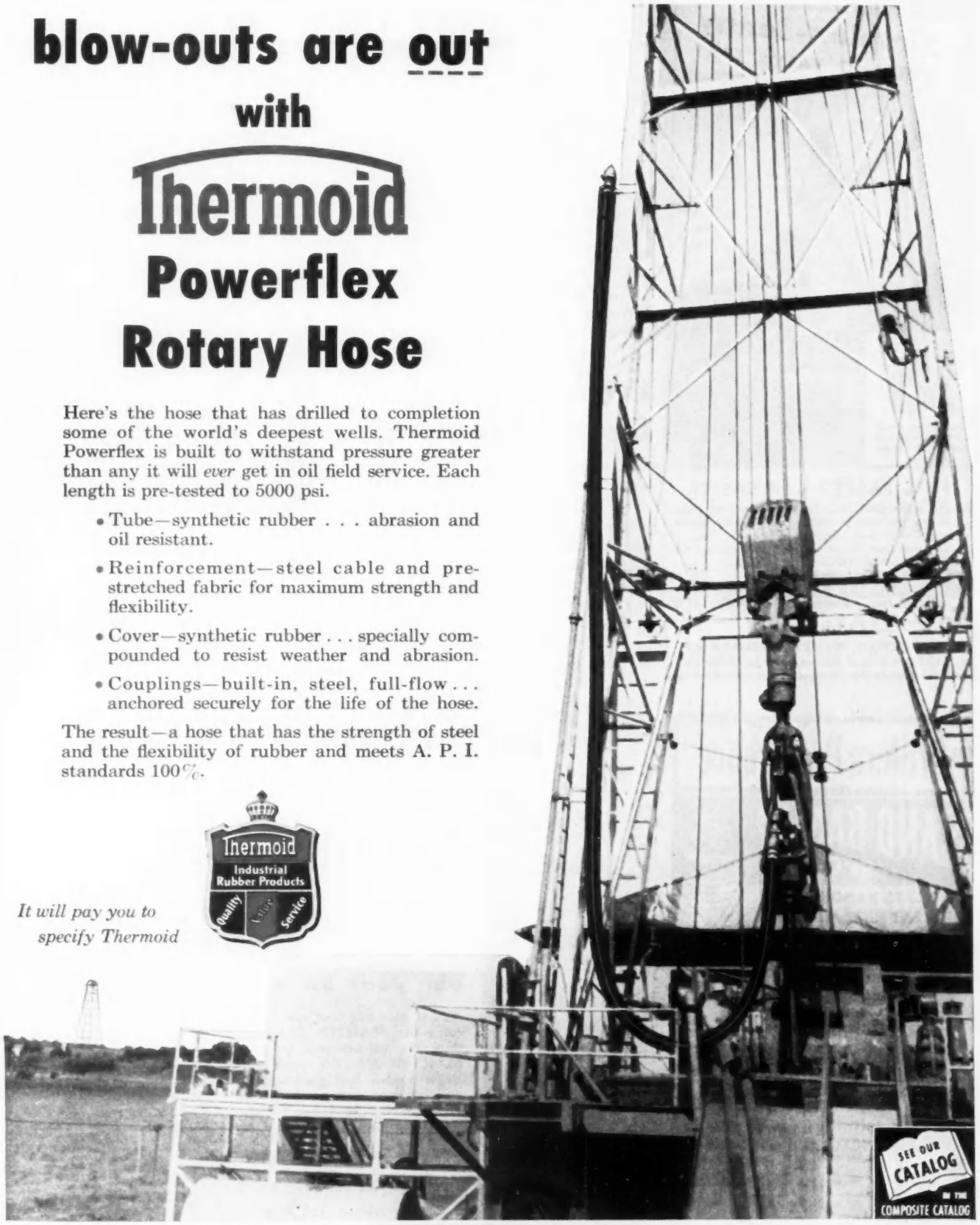

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ments but from articles dropped from the rig floor.

The cover can be made from any type sheet metal. The cover supports are composed of four three-inch pipes welded at the bottom to the engine base. At the top is a removable bolt. Inside these three-inch pipes are telescoped 2½-inch pipes with holes bored near the top to fit the removable bolt.

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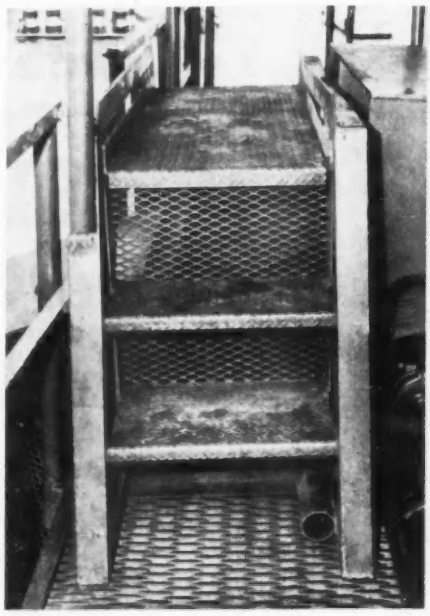
Crossing slick belt guards has resulted in injuries to crewmen; however, it is often necessary for rig personnel to cross the belt guard in moving from the engine to the compound side of the rig.

To eliminate the hazard of crossing elevated belt guards, an operator removed a section of the guard panel and installed a stair-way crossing. The severed guard section is housed with a face plate so that there is no danger of falling objects hitting the moving belts.



Constructed of two-inch angle iron, non-slip walk-way plate, and expanded metal, this crossing system allows ready access from the engine side to the compound side with complete safety.

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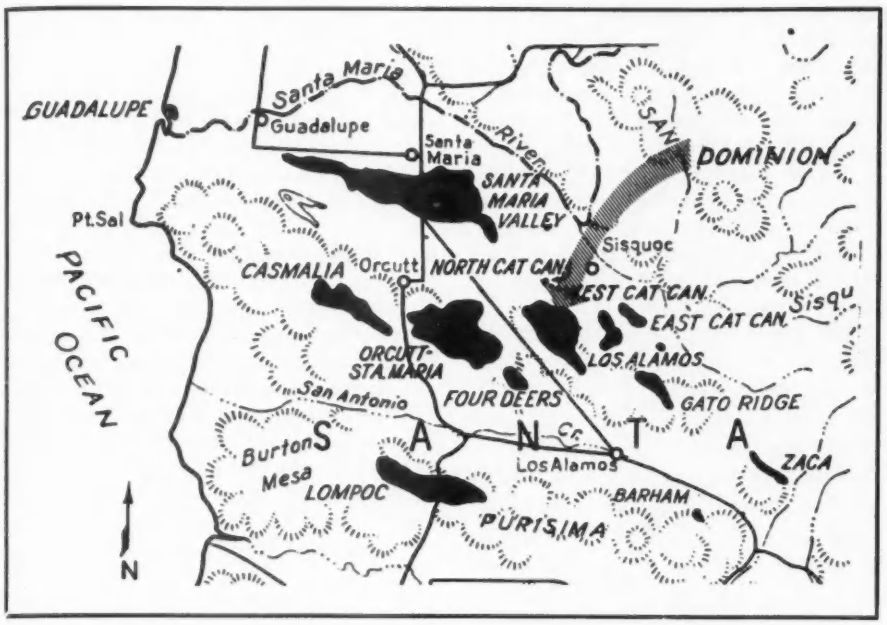


West Cat Canyon field is in an area that has contributed substantially to California's oil history. Nearby is Orcutt-Sta. Maria field where state's first gusher was completed in 1904.

At West Cat Canyon They're . . .

Producing Heavy, Viscous Crude

Unique Pumping Practices and Tank Battery Hookup Solve Problem Of Low API Gravity and High-Viscosity Oil in West Coast Field

DIFFICULT production problems encountered by Sunray Oil Corporation in the development of its Dominion lease in the West Cat Canyon field of California's coastal region has resulted in the application of interesting deep well pumping techniques which are proving successful in handling the heavy crude being produced from the field's fractured shale and chert reservoir. The success so far achieved by Sunray is likely to influence production techniques in other areas where low-gravity oil presents similar lifting problems.

Following a nationwide demand for heavy crude oil shortly after the outbreak of the Korean conflict, Sunray undertook to step up development of its Dominion lease. From a daily production of 200 barrels prior to mid-1950, the company had ten wells as of April 1, 1952 and was producing about 1300 barrels of oil per day representing more than 30 percent of the output of the Coastal district and about seven percent of Sunray's total production in California.

The West Cat Canyon field is located in an area which has contributed much to California oil history. The state's first gusher, the Hartnell 1, was completed in the nearby Orcutt-Sta. Maria field in 1904 for an initial production of 12,000 barrels of oil per day and flowed at the rate of 10,000 barrels daily for many months. Several heavy producers were completed in West Cat Canyon proper during development of the shallow Sisquoc (Pliocene) sand. The discovery well, completed in 1908, flowed between 6000 and 10,000 barrels a day. Most producers, however, were completed for initial production of from 150 to 300 barrels per day and were extremely long-lived due to the thick pay section which approximated 150 feet of net sand in the majority of the shallow producers.

In 1938 commercial production was found below the Sisquoc sand in a fractured shale and cherty zone in the Monterey shales of upper and lower Miocene age at approximately 6300 feet. It was found, however, that the degree of fracturing in the pay zone and the amount of fractured chert encountred varies from well to well and has considerable influence on well productivities.

Sunray entered the West Cat Can-

yon play in 1947 acquiring rights from the Karda Corporation to all minerals below the Sisquoc on the 270-acre Dominion lease at the northeast edge of the field, and a year later completed its first producer to establish a new trend northeast of the then developed portion of the field.

300-Barrel Producer

Sunray's No. 28 was the discovery well, shown in the southwest corner of the lease in Figure 2. It, like the next well, No. 38, was a 300-barrel producer. The third well, No. 48, was completed in March, 1949, and averaged 303 barrels daily for the first 26 days.

When development was resumed late in 1950, the Dominion No. 47 was completed as a 370-barrel well and No. 46 as a 450-barrel producer. The erratic nature of the reservoir then became evident. No. 45, a north offset to No. 46 was only a 50-barrel well. The next two completions, Nos. 36 and 35 were average producers but they were followed by No. 34 which averaged 411 barrels daily on a 23-day test. However, the north and west offsets to No. 34 were dry. The completion pattern indicates that every new well must be classed as a semi-wildcat regardless of its location to proved production.

In addition to its relative importance, producing problems as already indicated make the Dominion lease of more than passing interest. Because the crude is of low API gravity and high viscosity, and some wells have a high water cut, pumping loads are believed to be among the highest in California. To facilitate pumping the 6300-foot wells, diluents are used. Experimental two-speed transmissions and fluid couplings are being tried. In order that crude can be transported at lower pump pressures and excessive well back-pressures avoided, heaters are necessary in the flow lines of wells most distant from the central tank battery.

Fast time is made in drilling the 6300-foot wells. On the average, ten days are spent in making hole to 5000 feet, casing is set in 20 days and the well is completed in a total time of 28 days. Drilling costs are about $75,000 and an added $25,000 is required for surface and subsurface pumping equipment.

Typical Program

A typical hole-size program runs as follows: 13⅜-inch surface casing is set at 440 feet; then 12¾-inch hole is drilled to 3000 feet; 11¾-inch to about 4000 feet, 11-inch to 4600 feet, and 10⅝-inch to bottom.

After drilling through the pay zone, electric logs and micrologs are run. Based on the number of feet of permeable zone shown on the log, the well then is completed or abandoned. It has been found that the number of feet of zone shown on the microlog is directly proportional to a well's initial production.

If the well is to be completed, a seven-inch combination string is run. Usually the string contains about 1700 feet of perforations, and is set by cementing through perforations at the top of the Monterey section.

No high-pressure gas or saltwater zones are encountered in these wells. Accordingly, drilling is conducted with a normal claywater mud from top to bottom of the hole. Upon completion the drilling mud is circulated from the hole with saltwater. Using a perforation washer, the perforated section then is washed with salt-water to remove the mud cake from the walls of the hole behind the perforations.

All wells are completed as pumpers, with gravity of the crude ranging from about 9 to 14 degrees API. Higher gravity crude is found in the upper part of the zone and the heavier oil comes from the lower zone. From the position of the oil zone within the Monterey section, it is possible to predict the gravity and viscosity of the oil to be produced by a new well.

As mentioned earlier, loads placed on the pumping equipment are exceptionally high. Dynagraph tests show rod stresses as high as 45,000 pounds per square inch at some wells. Principal means of efficiently and economically coping with these high loads are the use of high-tensile rods and long, slow-stroke units with a high torque rating.

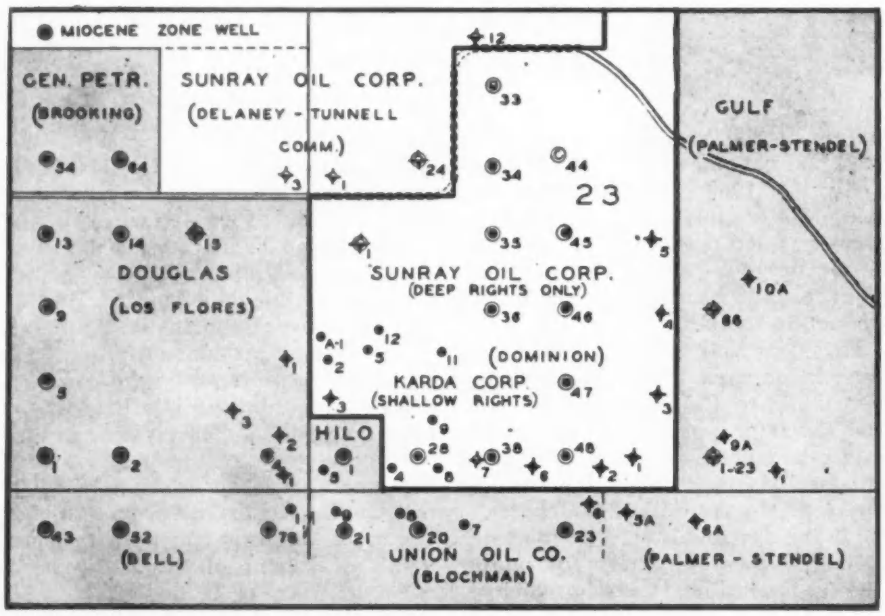
10-Foot Stroke Units

Nearly all wells are equipped with 10-foot stroke units, powered by gas engines and operating at pumping speeds of about nine strokes per minute, maximum. High-tensile rods and tapered rod strings have minimized rod failures. Pumps used are of 1¾-inch, 2¼-inch, or 2½-inch bore, run in 3-inch tubing, and in most cases are of the sectional-liner insert type.

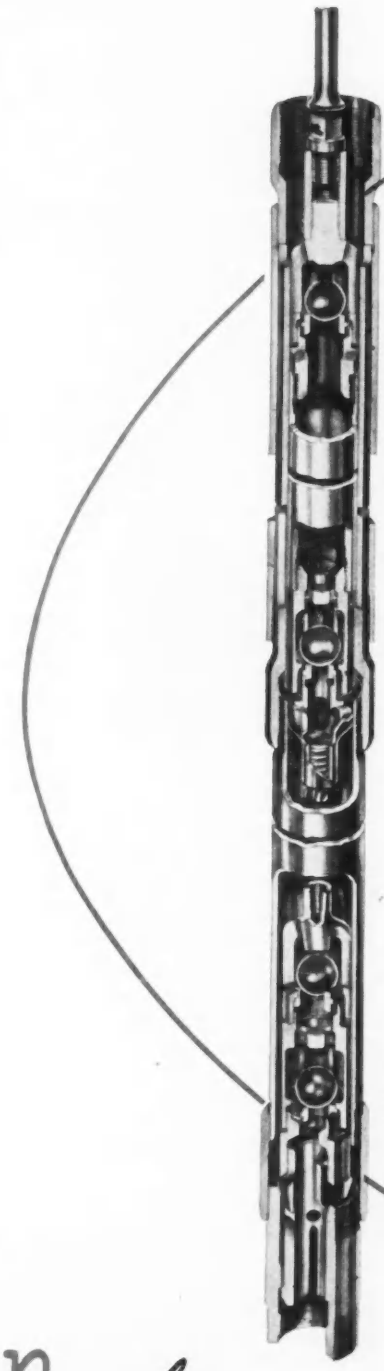
Equipment and practices used at Dominion 34 offer a fair example of what is being done at most other wells. Drilled to 6270 feet, No. 34 was completed for a 24-hour initial production of 528 barrels of fluid, of which 474 barrels were 13.6-gravity crude. Casing pressure was 25 psi and tubing pressure was 200 psi.

When the most recent fluid level was run, No. 34 was producing 466 barrels of crude and 20 barrels of water, with the unit pumping at the rate of nine strokes per minute. Fluid level at that time was 2850 feet, which means there were 2837 feet of fluid over the pump.

The foregoing describes general pumping practices. At Dominion 45, however, kerosine distillate is injected into the annulus to lighten the rod



Detailed well locations in Sunray's Dominion lease in West Cat Canyon. Nine wells on lease produce about 1500 barrels of oil daily. This is about 7 percent of Sunray's California production.



Axelson "TLE" (Tubing Liner) Pump shown. There is an Axelson Deep Well Plunger Pump for every specific well condition.

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Heavy, viscous crude is lifted by engine-driven pumping units using 10-foot, slow stroke. This is Sunray's Dominion 36 pumping from approximately 6300 feet.

load and permit the rods to fall faster. Diluent is introduced by means of a positive injection pump actuated by a mechanical linkage attached to the walking beam. About three barrels of distillate daily are injected into the 40-barrel producer. This is sufficient to raise the gravity of the produced crude from 9 to 11 degrees API.

To avoid overloading when the pumping unit is started up, or if for any reason the injection of diluent fails, a two-speed transmission has been incorporated in the drive. Manually operated, this transmission permits pumping speeds to range from about two strokes per minute to a high speed of eight strokes per minute. Though still experimental, this means of gaining flexibility in pumping speeds has proved highly satisfactory to date.

Unusual Installation

Another unusual installation, also of an experimental nature, is the fluid-coupling drive being used at No. 35. Through means of this drive a variable, slow stroke can be attained. While fluid couplings have been applied to pumping units elsewhere in California, this is believed to be the first time they have been used with this amount of power and such heavy loads.

Treating problems encountered center largely around those associated with the handling of low-gravity, high-viscosity wet crudes. As produced, the crude has a temperature of approximately 100° F. Upon reaching the tank battery, or even before the wells have long lead lines, the oil is maintained at temperatures in excess of 160° F. until it is ready to ship. Average cut of these wells is approximately 30 percent.

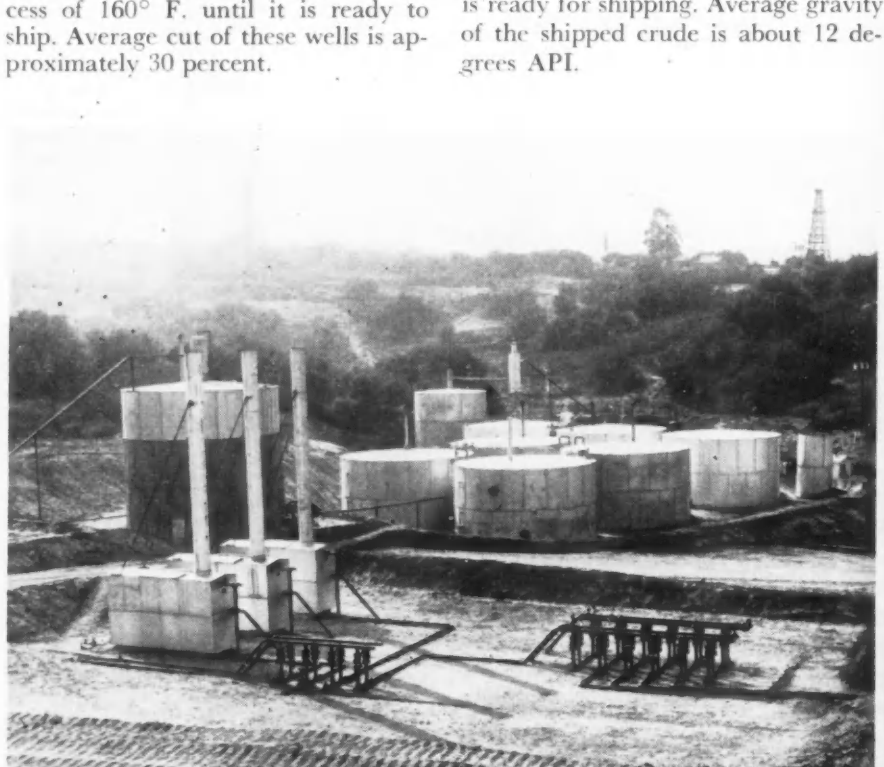
Where flow-line heaters are used, units employing indirect firing are used. These are placed as close to the well sites as safety and convenience will permit so that excessive well back-pressures can be avoided. Gas fired, they will heat the crude to a discharge temperature of 180° F. The lease produces gas sufficient for fuel requirements only.

In the water knockout tanks at the centralized battery, the water cut is reduced from about 30 to approximately 7 percent. In the settling phase, the cut is further lowered to pipe line specifications of three percent or less.

Temperature Raised

Direct-fired tubular heaters raise the temperature of the well fluid to 180-200° F., while in the knockout tanks a temperature of 170° F. is maintained. It is this drop in temperature which tends to settle out most of the water. Height of the water in the knockout tanks is automaticaly controlled by electronic oil-water interface level controllers.

After a settling tank is filled, its contents are raised to 180-195° F. by means of steam coils placed in the bottom of the tank. Steam then is shut off and the tank allowed to stand some 12 hours, after which the crude is ready for shipping. Average gravity of the shipped crude is about 12 degrees API.



All crude produced from Dominion lease is handled by this centralized tank battery. Tubular heaters and manifolding in foreground were added to care for increased production.

Two schools of thought on . . . . . .

'Increase initial productivity index as high as possible through selective acidizing. . . .'

The Acidizing Controversy

'When wells produce commercially from widely differing permeable zones in a limestone formation, do not acidize until necessary . . .'

By PAUL W. MORRISON

The Chemical Process Company

Fort Worth, Texas

MORE confusion than conclusion has emerged from the interaction between the technical and economic aspects of multizone completions and the vagaries of limestone formations. When two or more zones of varying permeability in a single limestone formation have been penetrated, one zone may become depleted while others are far from depletion. This has been true for multizone wells completed without the aid of acid as well as those that were selectively acidized. This opposing fact has engendered two schools of thought regarding selective acidizing procedures, and particularly where good producing wells are involved.

In addition to the completion of new wells, selective methods have been essential to the recompletion of old wells. No question is raised when such procedure is deemed necessary to secure commercial production. When better producing wells are involved however, the questioning begins and increases as the potential of the wells.

One school of thought contends that if selective acidizing will help marginal wells it will make better wells out of good ones. They believe that at the time of the original completion, all possible means should be employed to provide each well with the highest possible productivity index.

This type of completion of course requires intensive testing, surveying and the probable application of controlled acidizing methods with consequent high completion cost. It is believed that the slower draw down made possible by such practice will: (a) Defer increased lifting costs occasioned by remedial work to a much later date or may eliminate it as far as primary recovery is concerned; (b) Increase ultimate recovery to more than offset higher completion costs. Carried to the ultimate, as yet a more or less vague hope, this group envisions a completion that will permit the concurrent and uniform depletion of all zones.

Efforts to attain this goal are generally thwarted by changing conditions that attend depletion operations. Fluctuating differential pressures, expanding gas caps, and water encroachment are some of the factors that tend to distort what might have appeared to be an ideal completion.

Other View

In view of these complications, and frequently motivated by short range economic considerations, some operators proceed on the assumption that a well which will make its allowable should be left alone until it pays out or declines below commercial limits. Only then are they willing to investigate the possibility of further depletion. It is contended that production experience will establish characteristics on which a recompletion may be predicated that will more or less compensate for changes that have taken place. It is further contended that early acidization will not only hasten but will accentuate these changes. Obviously it is possible to present case histories to support both of these concepts.

Where there is reason for such divergent attitudes there is need for continuous and diligent investigation if the differences are to be resolved. This article does not pretend to solve any of these problems. It is written with the hope of stimulating salutary controversy that may result in increased efficiency in the conservation of our natural resources.

Typical Case

As a practical illustration of our problem and as a reference point for discussion, a study of the Fullerton Clearfork (Permian) field in Andrews County, Texas, should be helpful.

If ever a field appeared to be set up for selective acidizing, this one was it. The pay section was composed of three fairly well defined and thick zones, separated by thick layers of impervious rock. Early in the development of the field one operator took productivity index tests on each of the three zones both before and after acidizing with the results shown in Table 1.

Most of the wells in the field were acidized on completion, although procedure methods were not uniform. Now after approximately seven or eight years of production experience

About the Author

PAUL W. MORRISON was born in Colorado but has lived in Texas most of his life. He attended Kansas State College and Trinity University, receiving a B.S. in chemistry from Trinity in 1925. He joined the Chemical Process Company in 1933. From 1935 to 1949 he was assigned to various treating operations in West Texas and New Mexico. In 1949 he was transferred to Fort Worth as sales manager, his present position.

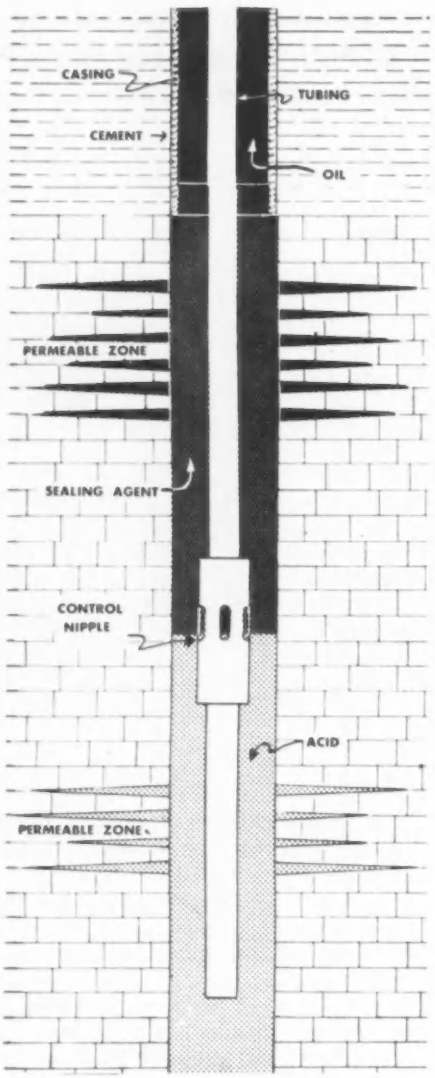


FIGURE 1. Treating lower zone using sealing agent and control tools.

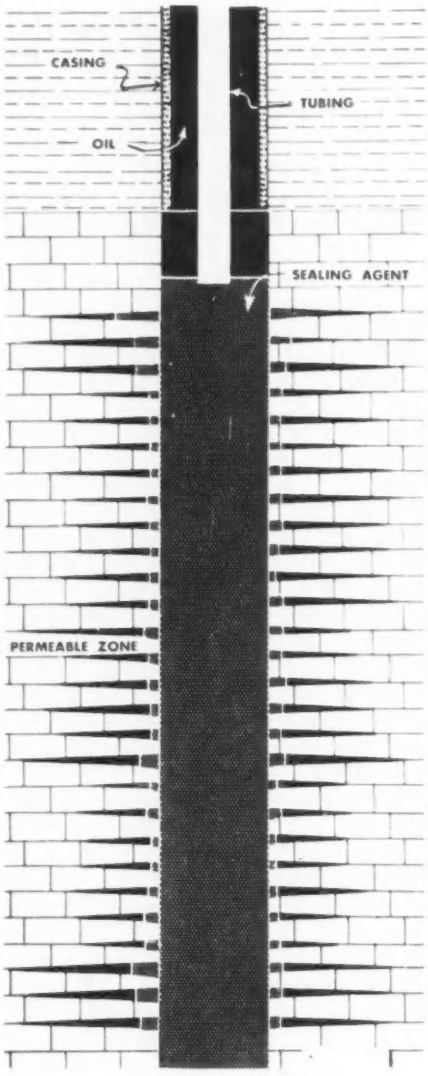


FIGURE 2. Schematic representation of well after sealing agent injected.

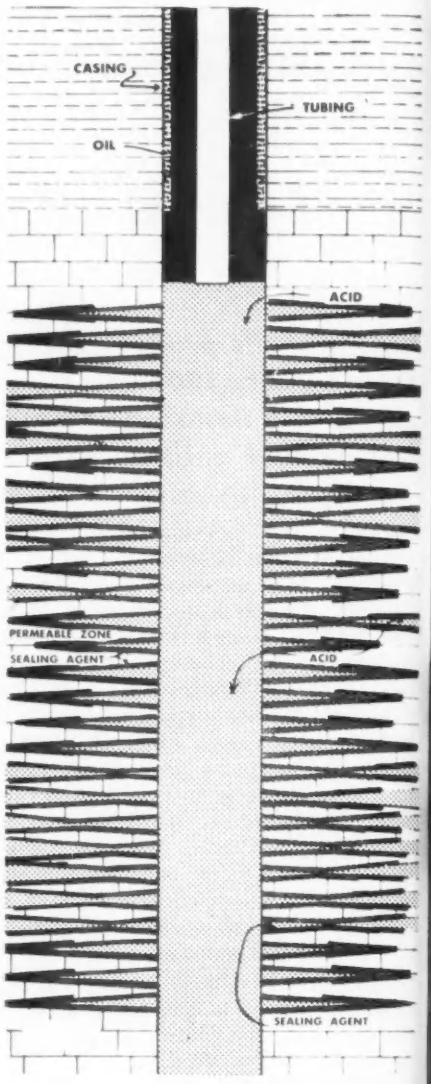


FIGURE 2A. Same well depicted in Figure 2 during injection of acid following application of sealing agent.

the only wells in the field that have a satisfactory gas-oil ratio are wells that were not acidized.

It may be a bit early however to draw the obvious conclusion. The unacidized wells are located in the most prolific part of the field. It is not expected that they will be fully depleted without acid treatment of some kind. Many of the other wells could not have long maintained their allowable without benefit of acid treatment.

In most of the field, the effective gas cap occurs in the upper zone. When it is sealed off the lower zone makes water.

Permeability differentials within a single zone are frequently as great as those between zones. This is particularly true if the zone is very thick or contains numerous stringers that may or may not be interconnected. From this it follows that acid treatment may greatly increase the secondary permeability along a comparatively thin plane through one part of the zone without appreciably affecting other secondary channels. Such a condition charges this enlarged channel with draining the greater part of a thick zone that may have a matrix permeability of .1 millidarcy or less. Of course, the same relative condition could exist in a well that had not been acidized.

As the areas adjacent to this channel are depleted and the movement of oil from more remote regions of the formation is progressively retarded by traversing greater distances through the less effective permeability, the pressure gradient rises sharply. This condition is essential to the depletion of the zone but is also conducive to early water encroachment or an expanding gas cap. In the latter events, oil is trapped that might have been recovered with ease had the rest of the secondary permeability been fully developed. In the case of isolated stringers, there may be only slight depletion or none at all.

Until a fairly recent date, no acceptable means were available to overcome these intrazone permeability differentials. A temporary sealing or plugging agent is now being used effectively for this purpose.

Table 1

ZONE	Acid Used Gals.	Productivity Index		
		Before Acid	After Acid	Increase
6750–6950.....	8,000	0.076	0.198	2.60
6950–7100.....	8,000	0.145	0.362	2.50
7100–7250.....	8,000	0.250	1.690	6.75
Total Average...	24,000	0.471	2.250	3.95

Temporary Sealing Agents

In substance this plugging agent is a jellied kerosine. It is pumped into the well in a liquid condition where in a short time it assumes the consistency of a heavy viscous jelly. Mixed with the gel is a breaking

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Down goes a slush pit — fast. Note how steep blade angle reduces length of ramp. Note how higher, narrower blade handles a bigger vertical load — speeds digging of deep, narrow pit.

agent that will return it to a liquid state that will flow from the well within a few hours.

The viscosity, weight and breaking time of this material can be controlled in the formulation. Pressures as high as 2250 pounds per square inch have been maintained against this seal. It has proved to be effective in the reconditioning and recompletion of old wells where other means of control were not applicable. It is used to seal off one zone while acid is injected into another one. The use of control tools (electrical signaling apparatus) in conjunction with this type of treatment permits positive control in spotting both the gel and the acid over the desired interval. This type of treatment is depicted in Figure 1.

More pertinent to this discussion is the technique by which this gel is squeezed into the formation. Treatments of this type indicate the validity of the "trapping" illustration depicted above. In the reconditioning of old wells this treatment has been applied to single zone wells and to single zones in multizone wells. A predetermined amount of the sealing agent is squeezed into the formation followed by the acid. The gel seals off channels of greater permeability and acid is forced into less permeable ones. In a majority of cases, a permanent increase in production has indicated the release of previously non-recoverable oil. Figures 2 and 2-A schematically depict this type of treatment.

Advocates of what might be termed the "progressive" school of thought contend that if these wells had received the same treatment on original completion they would not now require remedial attention.

Several new wells have received this treatment but insufficient time has elapsed for any positive determinations to be made. A report on one of these treatments however is indicative.

The well was marginal, a potential dry hole, drilled to the San Andres section in the Permian Basin. The treatment consisted of two 3000-gallon slugs of acid separated by a 500-gallon slug of the sealing agent. The first acid slug was injected at 2300 psi. After the gel had been squeezed, the second acid slug required 2700 psi injection pressure. The operator reports the well to be producing on a par with potentially better wells on the lease that received a conventional treatment. At this point the pertinent fact is the increase obtained in injection pressure.

What the ultimate effect of such treatments in a solution-gas reservoir might be is mere speculation at this time. In the event of high bubble points it is difficult to see how the formation of a gas cap might be prevented. It is reasonable to assume however that a better development of the secondary permeability would permit the recovery of larger amounts of oil before it formed. The same would be true of water drive reservoirs.

In view of what is known about induced fractures it is also reasonable to assume that in formations where the secondary permeability is limited, it could be augmented with fractures induced and enlarged by successive slugs of the sealing agent and acid.

As indicated earlier, none of this has resolved the controversy. It is not expected that it will be for some time to come. It is worthy of note however that the means for doing so were never better than they are today. To accomplish this it may be necessary in some cases to overcome the man who is always urging someone to "get that well off the drilling report."

Following along this line, there are other possibilities to be considered in the case of multizone wells.

The permeability differences between zones has already been depicted. Other tests from which some semblance of control can be established are generally conducted on a total well rather than on a zone basis. In the few instances where each zone has been tested as a unit, interzone differentials have been found to be as great or greater than those of permeability. In short, the production characteristics of each zone is apt to be as distinct as if it represented another well in another field.

When two or more such zones are produced simultaneously it is reasonable to assume that the efficiency of one or more of them will be impaired. This can result only in the loss of potentially recoverable oil.

One apparent answer to this problem would be a completion that utilized dual completion apparatus to produce each zone on an individual basis, predicated on an actual MER for each zone.

It would not be an inexpensive completion, and it probably would not be a trouble-free depletion. But it might recover enough oil to make it worth while if the secondary permeability had been developed to the maximum.

Potent Pix

Top honors from the Freedoms Foundation were won by "Man on the Land," the Oil Industry Information Committee animated technicolor film which dramatizes the partnership between the oil industry and agriculture, for its "outstanding contribution to the principles of freedom."

The film, one of 218 entries in the competition, has been winning acclaim wherever it has been shown. Votes of appreciation have come in from as far away as South Africa, where the movie is being shown by oil company mobile units.

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Well bore cross section. Dotted lines indicate wall reaming.
Cross section view of torpedo
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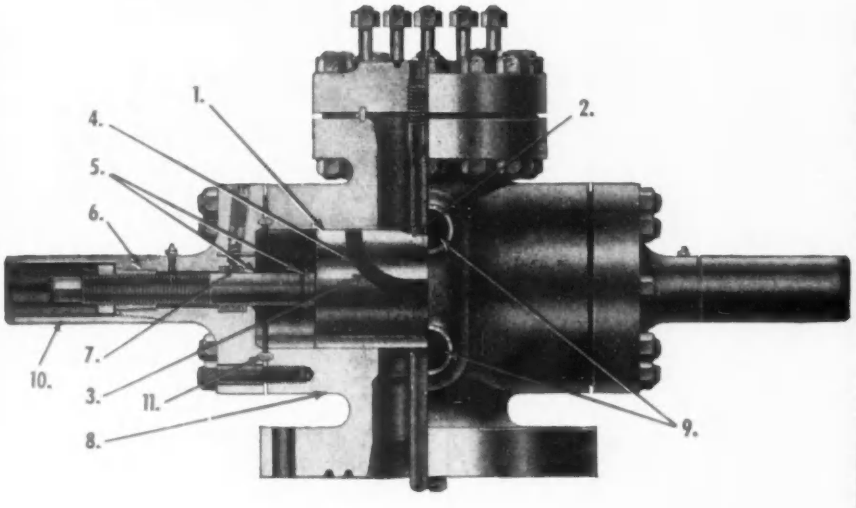

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When rams are closed upper segments and packing make first contact, forcing packing into pressure-tight seal with ram cylinder and around tubing.

4. SIMPLIFIED PACKING ARRANGEMENT
permits equalized pressure on under side and back of rams without ports or by-passes.

5. VALVE SEAT
in end flange and valve face on ram screw, seat when rams are drawn back; prevents well fluids from fouling ram screw.

6. THREADED BRONZE BUSHING
for ram screw eliminates steel-to-steel thread contact . . . assures easy movement of rams.

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around ram screws, between "V" retainers, assures pressure-tight seal.

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with less weight made possible by round rams.

9. SIDE OUTLETS,
threaded or flanged, provided above or below rams or one above and one below.

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can be used when rams are opened or closed.

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sealed to body with API ring gasket.

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Telescoping Anchor Cuts Completion Costs

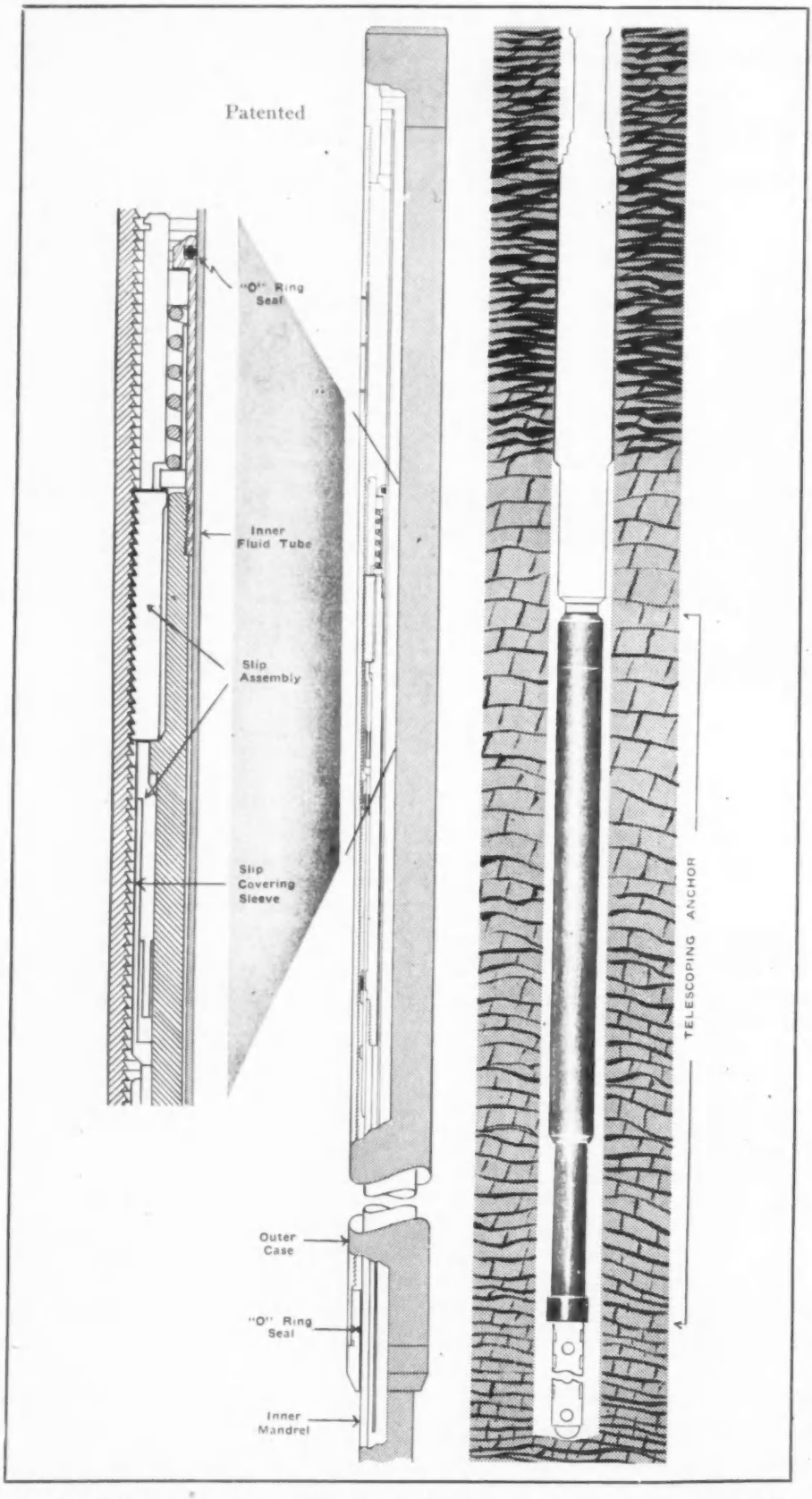

FIGURE 1 (left). Cutaway view of telescoping anchor showing enlarged view of slip assembly.
FIGURE 2 (right). Telescoping anchor and formation packer in open hole.

Anchor Type Packers When Equipped With Telescoping Anchors Can Be Moved and Respaced Without Making Round Trip

THE cost of completing wells in open hole have been materially reduced by cutting down on rig time required to change packer settings. A new development in completion tools — a telescoping anchor—is responsible for these savings. When used in conjunction with formation anchor-type packers, round trips to move and respace a packer are eliminated when it is necessary to "hunt" for an effective packer seat. Most popular application to date has been in acidizing, an operation in which this new tool has been successfully field tested for several years. It is also well adapted to packer settings when fracturing a formation.

In acidizing and selective fracture treatments of open hole sections, formation anchor-type packers are used in most instances to enable placement of treating agents into the desired section below the packer seat. A formation anchor-type packer must have pressure placed on top of it in order to get any degree of "put away" pressure below it. Since the packer seal is no better than the nature of the formation in which it is seated, the operator is faced with the problem of selecting a position in the open hole which will provide a good, hard, impermeable seat for the packer. This point has been—and in many instances continues to be—selected from electric logs, radioactive

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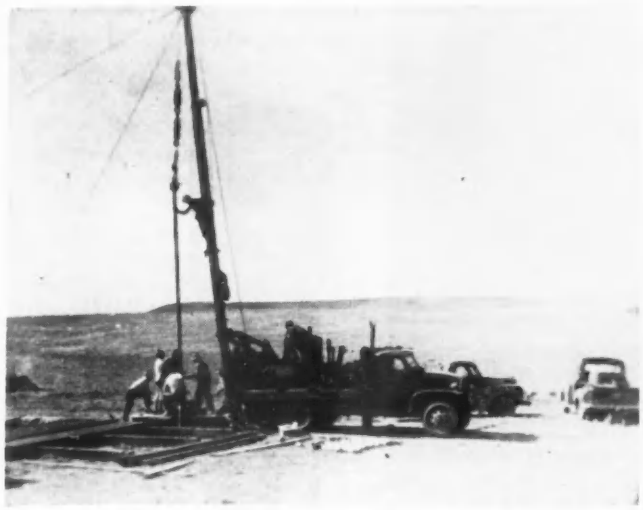

LEFT. Running 3½-inch O.D. glass fiber reinforced tubing in Continental Oil Company's Shonyo 5, salt water disposal well, Ellsworth County, Kansas. RIGHT. Field crew installing 3½-inch plastic tubing in salt water disposal well belonging to The Texas Company. Well is near Great Bend, Kansas.

Glass Fiber Installed in Salt Water Disposal Wells

It's Lightweight and Can Handle Larger Quantities Of Fluid; Installations in Kansas and Louisiana

By ANTHONY GIBBON
WORLD OIL Staff

A NEW thermo-setting glass fiber reinforced tubing has been installed in three salt water disposal wells, two in Kansas and one in Louisiana. It is non-corrosive, very light weight and has the ability to handle a larger quantity of fluid.

The latest installation, the second in Kansas, was recently completed at Continental Oil Company's Shonyo Salt Water Disposal Well 5 in Section 9-17s-8e, Ellsworth County. Hundreds of industry engineers and oil producers were on hand to watch 3293 feet of 3½-inch outside diameter glass fiber reinforced plastic tubing run in the well. The tubing was run inside new 7-inch O.D. steel casing set at 3281 feet. The well will act as a salt water disposal well for a number of other wells on the lease which are being hooked up. A feature of the installation was the ease with which crew members handled the 20-foot lengths because of their light weight.

In order to protect the casing from the corrosive action of the salt water and to indicate the condition of the formation and tubing, the fluid in the annulus was displaced with an equal weight of naphtha. Since the static level of the water in the well is about 734 feet down from the surface, the water column to the bottom of the casing weighs 1125 pounds per square inch; therefore the entire casing is protected with naphtha. The column of naphtha at static water level exerts 246 pounds psi collapse pressure on the tubing. Since bursting pressures are not excessive, it is expected the tubing will function satisfactorily within recommended operating range of 500 pounds psi collapse and 300 pounds psi internal operating pressure. Previous tests and experience show negligible stretch in the pipe. Tensile strength is rated at 10,000 pounds and while the tubing weighs two pounds per foot in air, the total weight of the partially submerged string is 3250 pounds.

Top joint in Continental Oil Company's plastic tubing installation. Note streaking effect of excess weldfast hardener used to cement collar to tubing.

For the most part the tubing was installed with conventional equipment except that two three-inch regular tubing elevators were used instead of tubing slips and they were inter-

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- COEFFICIENT OF THERMAL EXPANSION IS ESSENTIALLY THE SAME AS STEEL
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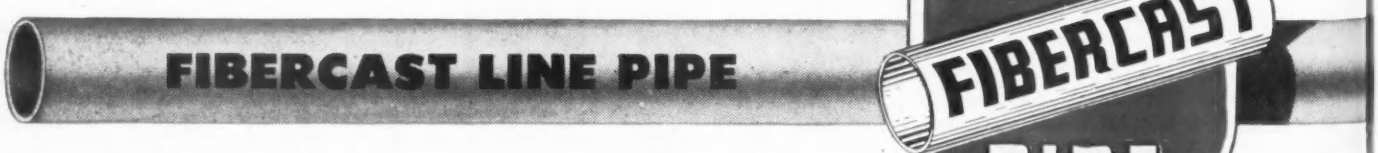

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changeably attached to a rod hook on a single line, thus eliminating a spider. Friction wrenches were used instead of tongs to make up the pipe.

The threads were lubricated with a graphite thread compound. While the pipe body is tough and durable the threads must be handled carefully. Excellent cooperation on the part of the well servicing crew resulted in running more than 150 joints before a thread was crossed. During the first installation in Kansas the derrick man experienced some trouble in stabbing the tubing. This was due to the light weight of the material and the fact that the installation took place during a strong wind. While the pipe is much lighter and consequently easier to handle than steel, it is difficult to stab, especially on windy days.

Tubing Non-Corrosive

The tubing is centrifugally cast in 20-foot lengths of thermo-setting plastic reinforced with glass fibers. It is non-corrosive and is not affected by common well fluids and gases. Acids generally used in the oil industry, cause no deterioration. No interior protective coating is required and thus the inside diameter if not reduced permits the pipe to handle as much as 50 percent more fluid. This, according to engineers, is a great advantage as it reduces investment and operating costs for salt water disposal wells, since water from twice as many wells can be handled through one disposal well provided the formation will accept the volume of water. Its weight of two pounds per foot in air compares with 10 pounds per foot in air for 3½-inch O.D. steel tubing.

The first installation was put in for the Superior Oil Company of California in a salt water disposal well in Jennings, Louisiana, and it has been functioning satisfactorily for several months. The first in Kansas was for The Texas Company in the Kraft-Prusa field, near Great Bend, where 3384 feet were run. During installation the morning crew ran 16 of the 20-foot joints in one 30-minute period and later speeded up to around a joint a minute during the afternoon.

Additional installations in salt water disposal wells are underway, one for Skelly Oil Company and another for Continental.

The new product, manufactured by Perrault Bros., Inc., at its Fibercast Division, Sand Springs, Oklahoma, is the result of intensive research along lines first tried out in the airplane industry during World War II.

Telescoping Anchor

• CONTINUED FROM PAGE 202

logs, sample logs and others. It was not uncommon at such select points that vertical communication would occur within the formation around the hard streak, and as a result, the packer failed to hold. Experience by some has indicated that although it was possible to obtain a good packer seat before acid treatment, the packer would frequently leak after the acid created vertical communication back through the formation. And another seat had to be located. With the exception of some particular fields where little difficulty is encountered in locating a good packer seal on the first attempt, it is not unreasonable to expect seating problems in many areas where open hole completions are made. When working on wells where effective packer seats are difficult to find, the operator has little choice but to expend time, money and patience in making round trips with the tubing and changing the packer anchor length with the hope of "hitting it the next time." In one known case, eight different attempts were made before a good packer seat was found.

Telescoping Anchor

To eliminate making costly round trips with tubing and changing packer anchor lengths in search of an effective packer seat, the telescoping anchor is constructed so that its length may be changed without removing the packer from the well. All that is necessary to change the packer seating point is that the tubing be picked up the desired distance and the telescoping anchor automatically will extend itself to form a means of support for the tubing weight placed upon the packer. Rotation or reverse screwing is not needed. A working extension length of 15 feet is available in current tools.

The telescoping anchor has been used successfully in finding packer seats for selective acidizing in several Permian Basin fields of West Texas. It has been used for formation fracture treatments in the Spraberry trend of the same area.

The telescoping anchor is composed of four important units as illustrated in Figure 1, (1) the outer case, (2) the inner mandrel, (3) the slip assembly, and (4) the inner fluid tube. The tool operates on the principle of opposing slips. Bore of the outer case has 30-degree buttress threads machined along its entire effective length. The slip assembly, shown in an enlarged section in Figure 1, is mounted on the upper end of the inner mandrel. When the tubing and packer are raised, the inner mandrel of the telescoping anchor will remain stationary. The buttress threads on the outer case of the tool will drag by the slip assembly until weight is applied downward causing the slips to engage.

All formation treating material is directed through the inner fluid tube, sealed by "O" rings, thereby preventing high-pressure flow of fluid around the slip assembly. An integral part of the slip assembly is a sleeve which automatically covers and compresses the slip segments when the tool is fully extended. This permits the operator to re-telescope the tool so that other packer settings may be obtained. Drilling mud, inhibited acid and gel-sand mixtures have not been known to affect the operation of the telescoping anchor. Figure 2 shows the tool as it is used in a packer installation.

The telescoping anchor has been tested successfully with 161,000 pounds weight on the tool in the set position. It can be used wherever 2½-inch external upset end tubing is normally used for a packer anchor. In some cases the tool may be used with packer anchors on shallow drill stem tests.

Good Scouts

About 240 West Coast boys sampled living in Sierra Mountain campsites this summer, with oil industry employes footing the bills.

The R. M. Pyles Boys and Girls Camp was founded in 1949 to furnish all expense-paid camping trips to youngsters, between the ages of 12 and 16, whose families couldn't otherwise afford the privilege. The children are selected through city and county law enforcement and welfare agencies from such oil producing areas as Kern, Los Angeles, Orange, Tulare and Ventura counties in California.

Camps were built by men from oil fields and offices, who volunteered their efforts, and are maintained entirely by contributions from men and women employed in petroleum and its allied industries.

Unitization Offers Economic Advantages

Greater Net Profit Assured Through Unitization in Secondary Recovery Programs Than Possible Under Competitive Operations

By

L. E. BROCK
Unitization Superintendent

and

BRUCE A. LANDIS, JR.
Unitization Section Engineer

Stanolind Oil and Gas Company, Tulsa

UNIT operations offer many economic advantages. Flare gas can be used in many ways. Allowables can be transferred from high gas-oil ratio wells to low gas-oil ratio wells. Greater ultimate recovery is obtained through this selective production. It is possible to store produced gas underground until a market is developed for its sale, and while effecting this storage by controlled gas injection into the reservoir, maintain the reservoir pressure at a point calculated to increase ultimate production. It is also possible to reduce operating and development costs and material inventories. The duplication of effort, camps, gas, water and other facility systems, tankage, pipe lines, pump stations, and administrative systems found under competitive producing operations can be almost totally eliminated under unitization.

There is a decided advantage of a common pooling of knowledge. Under the normal unit program, a vast fund of experience and oil operation know-how becomes available to every operator within the unit.

From an economic standpoint, a study made about 1930[1] stated that if the Seminole Pool in Oklahoma had been unitized instead of produced competitively, the saving in pool development costs by elimination of the wells that were not needed to deplete the reservoir would have been $17 million. The saving in operating costs in producing the field to depletion would have amounted to $14.5 million. These estimates were made on primary recovery only and no study was made of secondary recovery of oil. The $31.5 million which would have been saved was equivalent to 50 percent of the profits estimated for primary competitive operations. A similar study[2] showed an estimated saving of $51.7 million for the Santa Fe Springs field, California, had it been unitized instead of competitively produced.

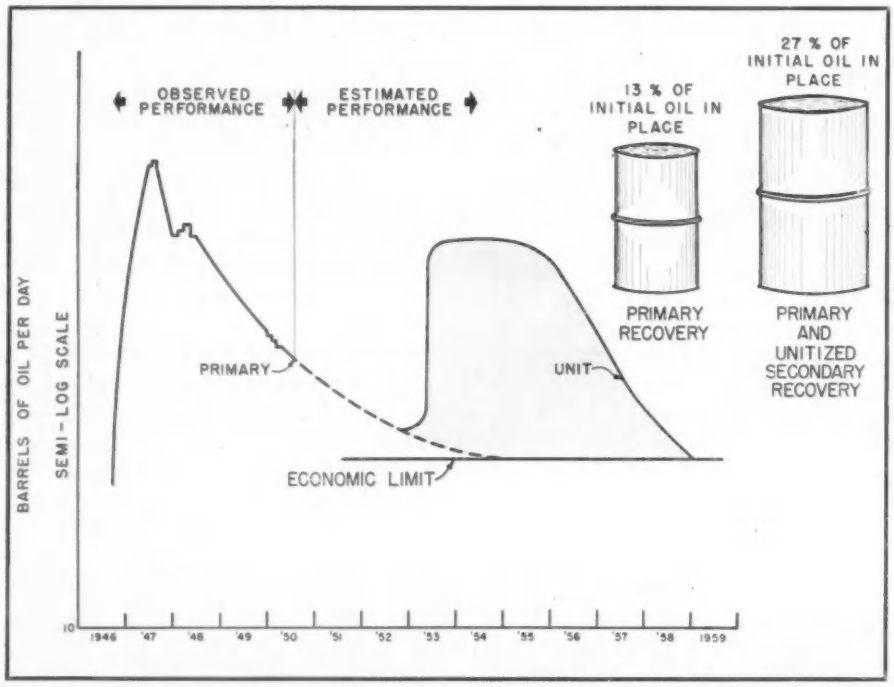

FIGURE 1. Primary field and unit field decline comparison. Unit A.

Economic Advantages

Secondary recovery programs that are started during the initial stages of depletion will usually afford the maximum ultimate recovery from an engineering and economic viewpoint. This is true not only because of increased efficiency in oil production, but also because of the minimizing of oil shrinkage in the reservoir, the extraction of liquids from the produced gas, and the saving of natural gas for future marketing.

This type of operation is extremely difficult, if not impossible, under a competitive production program where all operators, within the bounds of statutory regulations, produce from a common reservoir as each sees fit. The aid to highest ultimate recovery in this situation would be unitization. With unitization a greater return of profit can be expected because migration of oil in wholesale quantities to the best spots for collection can be encouraged rather than discouraged.

It is possible, of course, to initiate these secondary recovery methods on a competitive basis, but only with operational difficulty and at a sacrifice of depletion efficiency. To demonstrate this point the following analyses of four diverse unitized projects will show the economic advantages of unitization for reservoirs of widely dif-

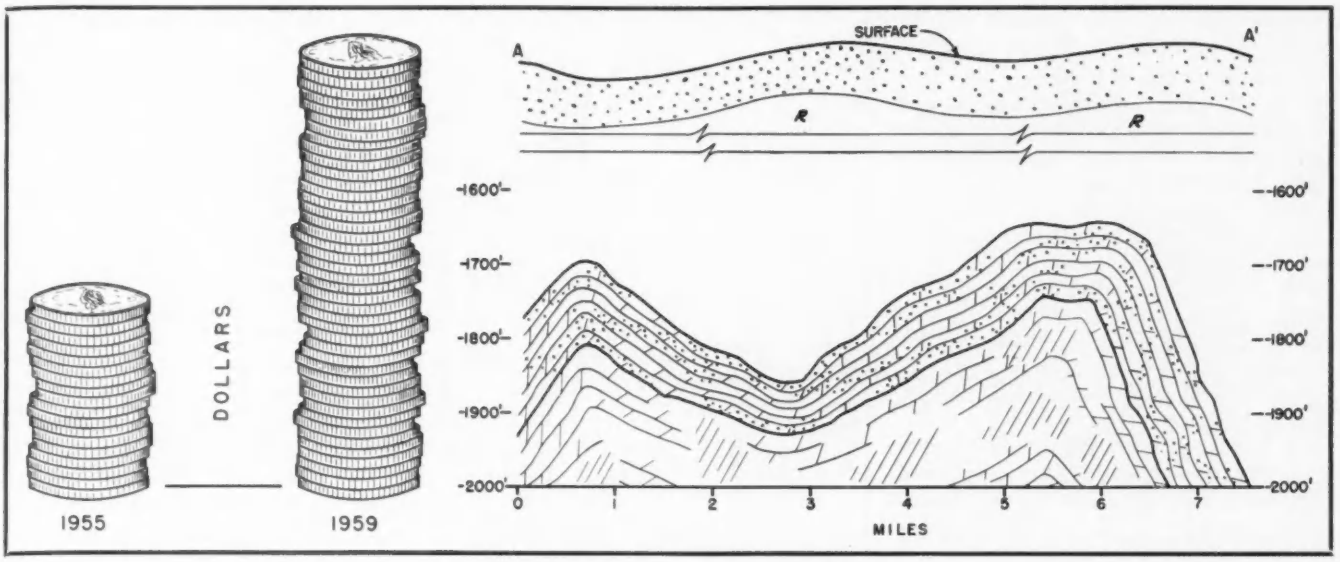

FIGURE 2 (left). Profit comparison between competitive secondary and unitized secondary. Unit A.
FIGURE 3 (right). Cross section Unit B.

ferent characteristics and in various stages of depletion.

• UNIT A. Consider Unit A, a volumetric type reservoir approaching the economic limit of production, which was unitized in order that a pattern water flood could be conducted. This reservoir is a monoclinic trap. A fault trending northeast-southwest bisects the field, but our studies indicate that there is communication of the porosity across the fault line. The field is roughly two miles east and west by three-quarters of a mile north and south.

Discovered in August, 1946, the field as of Oct. 1, 1950 had produced approximately 11 percent of the initial oil in place from some 57 producing wells on 10-acre spacing.

Reservoir and fluid characteristics were as follows:

1. Initial bottom hole pressure: 914 pounds per square inch.
2. Initial solution gas-oil ratio: 238 cubic feet per barrel.
3. Average porosity: 18 percent.
4. Average permeability: 150 md.
5. Connate water content: 13 percent.

There was no natural water drive or gas cap. No water except a negligible quantity of connate water had been produced in the field, and the only production problem of consequence was paraffin accumulation in tubing and flow lines.

Because of the foregoing demonstrated inefficiency of primary depletion, an investigation of the field was made to determine if a program for increasing ultimate oil recovery could be found. Engineering studies showed that a water flood, in which 23 of the existing wells would be utilized for injection, would be economical. It was decided that a modified five spot pattern was best suited to the plan of recovery and that no additional drilling of wells would be necessary if the field were unitized. It was further concluded that secondary operations were not desirable unless a unit was formed because (1) many wells were at the plugging stage and redrilling of the individual tracts was not justified because of the drilling cost of the wells; (2) a successful unitized flood would yield both remaining primary and secondary oil in approximately the same time as would be required to recover the remaining primary oil; and (3) elimination of the need to restrict fluid movement across lease boundaries within the unit would result in a greater recovery at less investment cost than individual or cooperative programs. Accordingly, a 730-acre tract owned by eight operators was unitized.

Summary of Studies

A summary of the engineering studies is shown by Figure 1, which is a comparison of the predicted decline curves for primary competitive and unitized secondary depletion of the field. It can be seen that about 13 percent of the initial oil in place would have been produced by 1955, whereas about a 27 percent recovery of the initial oil in place is anticipated

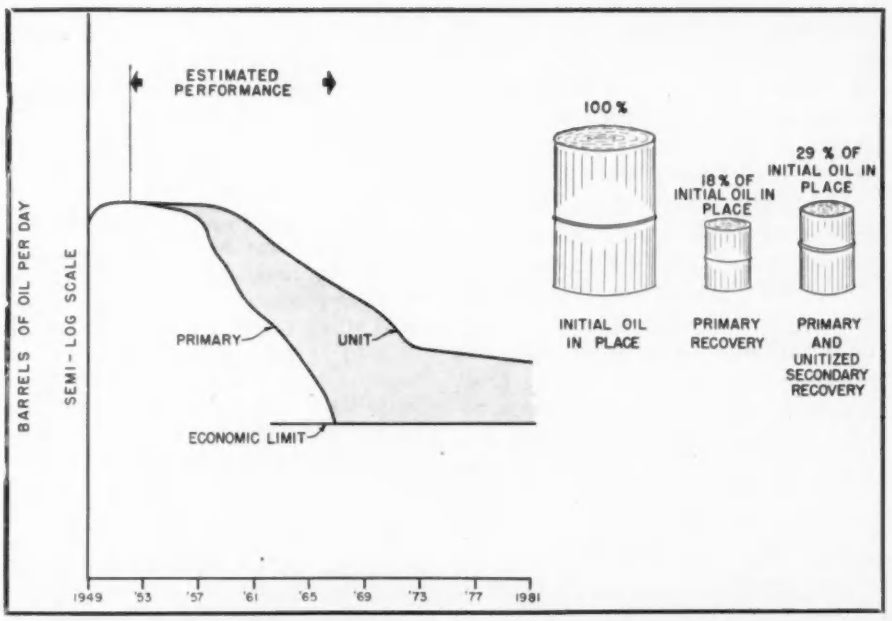

FIGURE 4. Primary field and unit field decline comparison. Unit B.

by the end of 1959. This is an oil recovery increase of 108 percent.

The unitization program in this field will effect the recovery of the anticipated 108 percent additional oil in the least expensive manner. Consider first the source of the flood water. Nearest surface supply is about 4½ miles from the field in an area of seasonal drought, therefore suitable only as a last resort. Initial investment, maintenance and operating cost of such a gathering system over the life of the flood would have approximated 18 percent of estimated unit profits. It was found that three shallow water-supply wells could be put into operation at a considerably lower investment. Peak unit requirements were estimated at less than 5000 barrels of water per day, and these three wells would provide a supply dependable at all times. On an individual lease basis at least eight supply wells would have been needed. This cost, together with additional producing or injection well cost would have made individual projects prohibitive, especially so for the edge leases.

Costs Prove Worth

Total water injection costs including those of investment, maintenance and operations were estimated to be about 24 percent of total initial unit investment. Between three and four million barrels of water will be injected into the producing formation, and the cost is expected to be well below five cents per barrel. This is certainly less than could be expected on an individual lease basis.

Total investment expense, including conversion and testing of wells, was quite small. A sum equal to about five times initial investment was estimated as direct operating expense. Summation of the various unit investment items indicated a ratio of profit to total unit investment of about 7 to 1 before taxes.

Contrast this with the state of the field as of Ocober, 1950. In the first six months of 1948 lifting costs per barrel of oil had suddenly risen sixfold, principally because of the extremely rapid production decline. This situation had become worse by 1950, and with primary depletion the operating costs per barrel would have continued to increase because of continued production decline.

Cumulative effect of individual floods could not approach the recovery figures as outlined for the unit. Without unitization large volumes of oil would be untouched by the flood

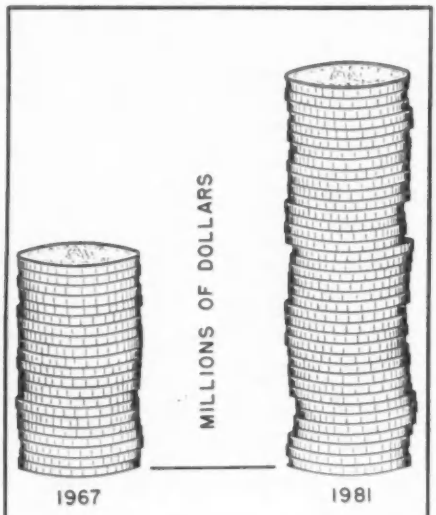

FIGURE 5. Revenue from primary and unitized secondary operations. Unit B.

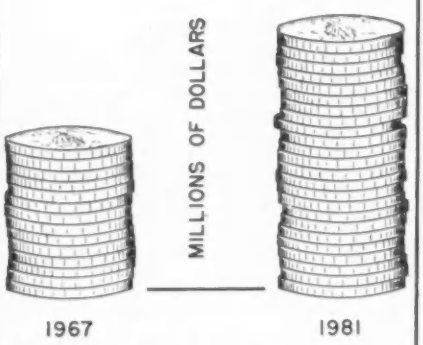

FIGURE 6. Net profit before income taxes for primary and unitized secondary operations. Unit B.

because several operators would not have attempted floods that required an investment for additional wells. Large volumes of oil susceptible to movement across lease boundaries under a unit flood would not be moved under a competitive flood for no operator will voluntarily push oil to a neighboring operator. Interference between floods would have isolated oil away from the well bore.

This clearly indicates that the formation of Unit A was the most economically beneficial way to attempt further recovery in the field. Every field study pointed to the alternatives of unit operation or early abandonment. Figure 2 shows the comparison in dollars between the profit which could have been expected from competitive secondary recovery operations and the profit conservatively expected from unitized secondary operations. It may be noted that profit from the unitized operations exceeds by 100 percent that of competitive operations.

Each royalty owner or working interest owner committed to the unit will receive his proportionate share of the proceeds upon a more equitable basis than would be possible under competitive production methods. The unit production, regardless of where in the unit it is produced, will be divided in accordance with the basis of partcipation, established in this case by exhaustive engineering study and negotiation. There will be no need for worry as to whether one particular lease is producing more or less oil than the reserves allotted to it for participation in the unit would logically support.

This is an outstanding example of the application of the learning acquired since the early experience of the petroleum industry. It was just this type situation of high initial well potential with subsequent steep rates of decline that prompted pioneer operators to pull stakes for a venture into virgin territory because they had no means to cope with increasing operating costs. We know today that most of them did not know that they were wasting reservoir energy and that more oil remained within the reservoir than they had captured; but we know now that the oil is there and that with proper methods of operation much of it can be recovered.

• UNIT B. A step in the right direction is Unit B, where quite a different situation is present from the standpoint of both the magnitude of the unitization program and the method of procuring the additional recovery. Analysis of the Unit B reservoir showed that competitive primary producing operations could be conducted for 17 years after 1950 before the economic limit of production would be reached. But this analysis also showed that in an additional 13 years the ultimate oil recovery could be increased 60 percent with a unitized dispersed type gas injection program.

Permeability Uniform

The reservoir is an elongated, bidomal, east-west trending anticline, and Figure 3 is an idealized cross-section of the pay zone along the axis of elongation. Communication barriers do not appear to exist within the pay and the permeability is quite uniform. However, permeability conditions are such that it is necessary to acidize the Permian dolomite to obtain production.

The pool was discovered in 1944, and the productive limits extended in 1946. By January, 1949 there were 116 wells on 40-acre spacing produc-

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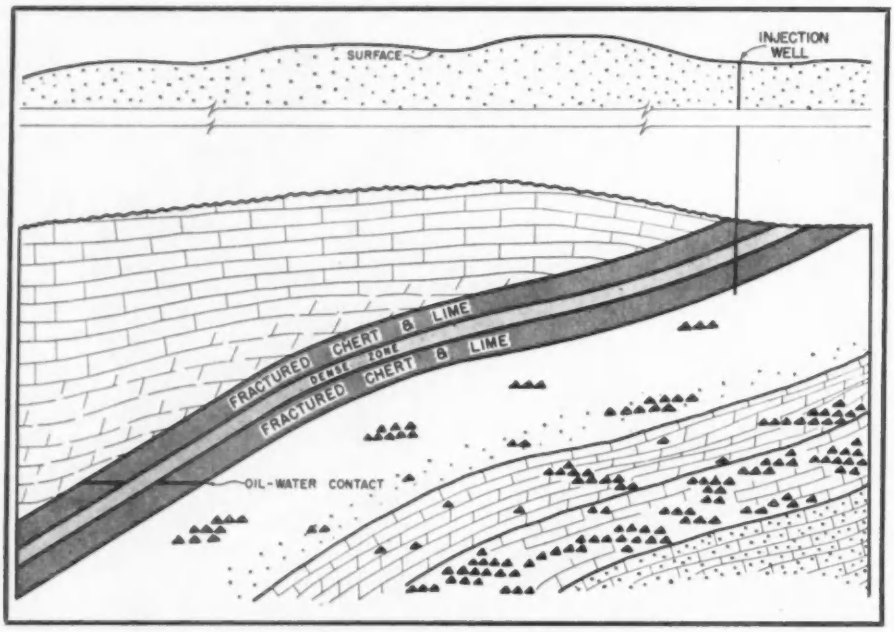

FIGURE 7. Cross section Unit C.

ing 8600 barrels of oil per day by artificial lift. Small amounts of water are produced with the oil in some portions of the field but no uniformity of water table has been found. It has been concluded, in view of the production history of the pool, that fluid expansion and dissolved gas are the sole sources of reservoir energy. The oil is especially characterized by having an abnormally low solution gas-oil ratio of only about 150 cubic feet per barrel.

7500 Surface Acres

After comprehensive engineering and economic studies about 7500 surface acres were included within the unit area, representing 72 separately owned tracts. Eight working interests and 231 royalty interests were combined to form the unit.

Decline curves shown in Figure 4 illustrate the expected advantage of unitized gas injection over primary depletion. It can be seen that about 18 percent of the initial oil in place would have been produced by 1967 (the abandonment date) under primary depletion. On the other hand, with the unitized gas injection program now in operation, an additional 11 percent of the initial oil in place will have been produced by 1981. The total recovery with this program will be about 29 percent of the initial oil in place. Doubtless too, before the field is finally abandoned, some other form of secondary recovery will be applied to the field in an attempt to reduce the estimated 71 percent residual saturation to a lower figure.

Figure 5 summarizes the economics of competitive primary and unitized gas injection operations for Unit B. The expected gross revenue after January 1950, with unitized gas injection, exceeds that for primary competitive operations by a ratio of 1.84 to 1, an increase of 85 percent.

Figure 6 shows net profit, before income taxes, after January 1950, for unitized gas injection to be in excess of that for primary competitive operations by a ratio of 1.74 to 1. This is a 74 percent increase. To obtain this 74 percent increased profit a total capital investment of less than 2½ percent of anticipated increased profit was required initially. Ultimately this may be increased to slightly in excess of 7 percent.

To present a comparison of cooperative or competitive secondary operations with unitized secondary operations would require a report in detail. However, in the light of past experience the benefits of the unit program as outlined for Unit B would appear to exceed materially any benefits to be gained by competitive secondary operations. One reason for this is that individual secondary programs would probably not have been instigated until at or near the primary depletion stage, at which time the reservoir pressure would have dropped so far below the bubble point pressure of 845 psia that many of the lighter hydrocarbons would have been separated from the oil in the reservoir, causing oil to be lost through shrinkage. Also, the oil viscosity would increase materially and this would require additional investment to obtain production and there would be less hope of profitable recovery.

Unit B is admittedly an undertaking of large magnitude. Millions of dollars and millions of barrels of oil are involved, but this is by no means an indication that we have reached the pinnacle of achievement. Some really "big timers" are in the formative stage at this very moment. One

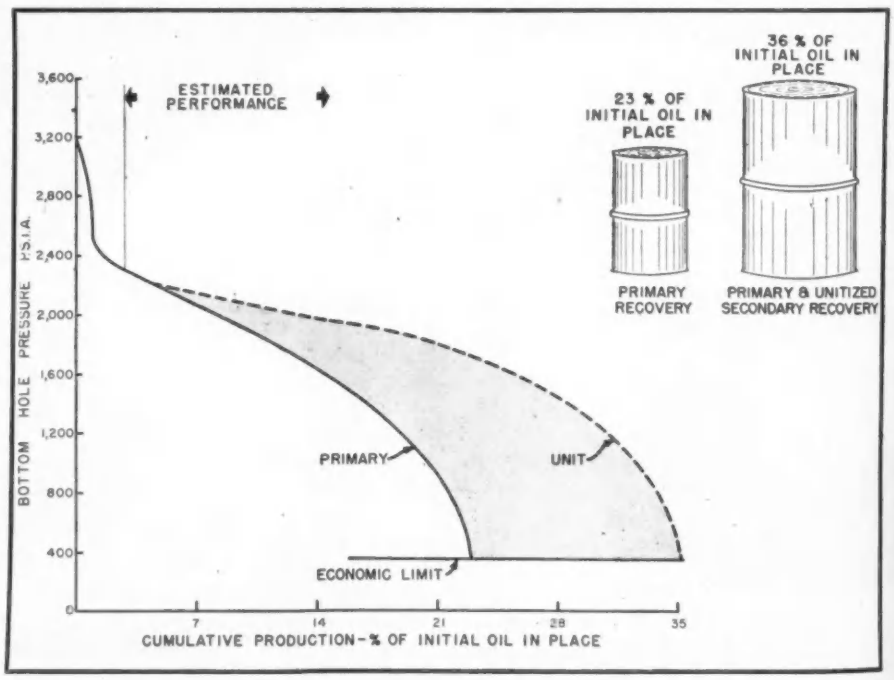

FIGURE 8. Bottom hole pressure decline primary and unit operations. Unit C.

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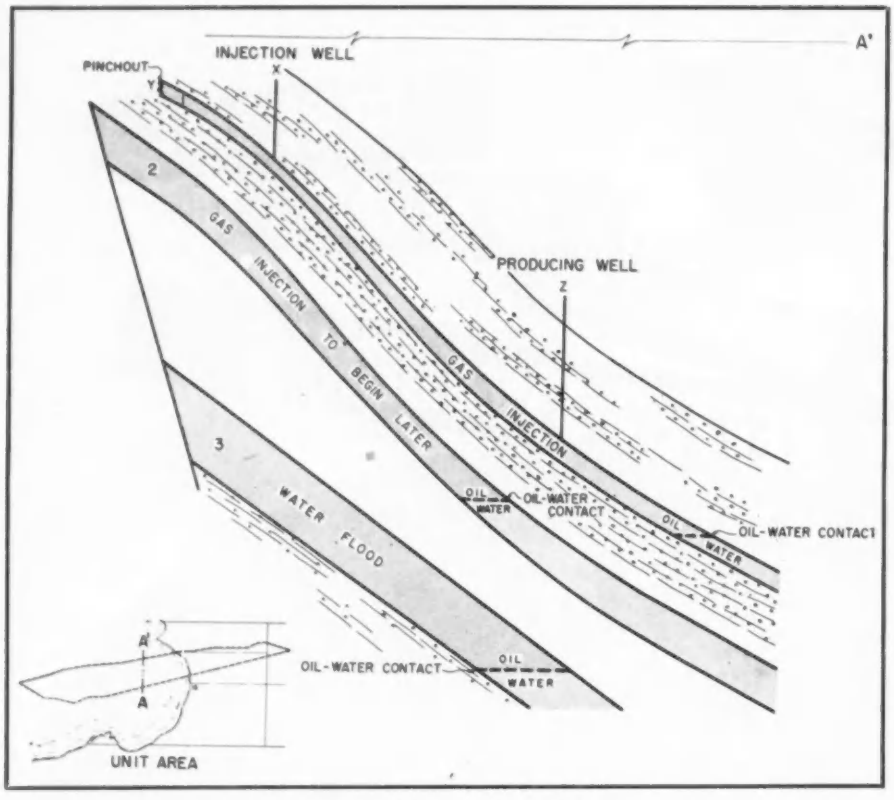

FIGURE 9. Cross section Unit D.

of these, encompassing more than 50,000 oil productive acres, has set its sights toward an additional oil recovery of more than 700,000,000 barrels, which is at least a 125 percent increase over primary competitive recovery. The economics of such a program will be reckoned in the billions of dollars.

• UNIT C. Unit C was formed for the reservoir shown in cross-section by Figure 7. An upper and a lower pay of Pre-Permian fractured chalky chert and lime are separted by a dense zone of impermeable limestone. Water-oil contact on the west, a fault on the south, a porosity pinch-out on the north, and truncation on the east define the productive limits. The degree of dip indicated that it was feasible to attempt the formation of a secondary gas cap at the top of the structure which would effect down dip migration of oil to wells lower on the structure.

The oil is characterized by a very high solution gas content of about 1200 cubic feet per barrel of oil, which will provide more than sufficient gas for the formation of the gas cap.

3700 Acres Unitized

An area of approximately 3700 acres, consisting of 14 separately owned tracts controlled by three operators, was unitized. The operators of an area contiguous to the unit, will cooperatively inject gas with the unit —a practice that detracts considerably from the overall picture of benefits which could have been derived if this contiguous area were included within the unit. But since it was not possible to unitize the entire area, the next best thing was done, and some injection cost reduction will be possible through use of the common facility.

Figure 8 shows the bottom hole pressure decline of primary operations as compared to unitized secondary recovery operations. Note that pressure maintenance will ultimately allow about 36 percent of the initial oil in place to be produced. If that portion of the field within the unit were permitted to decline at its

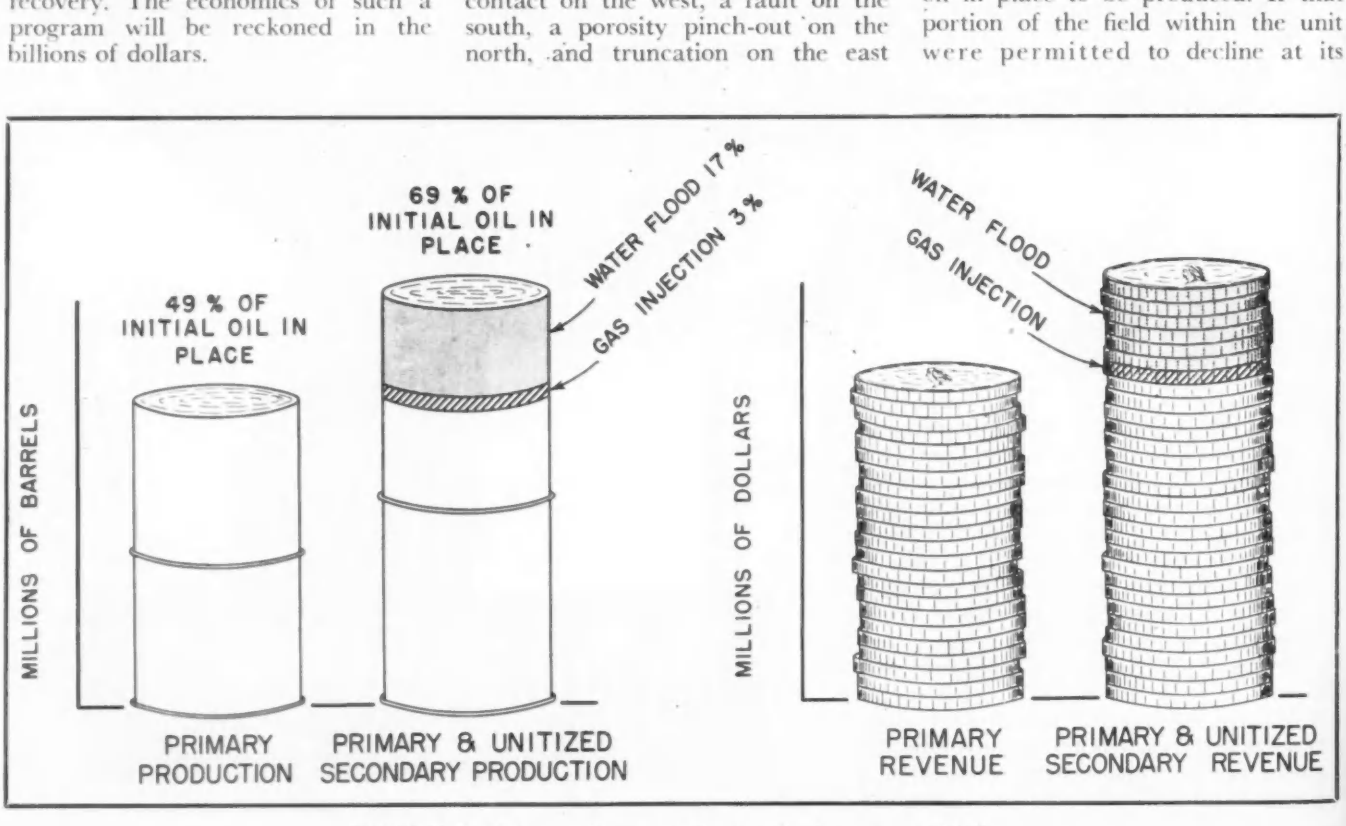

FIGURE 10. Production and revenue-primary and unit programs. Unit D.

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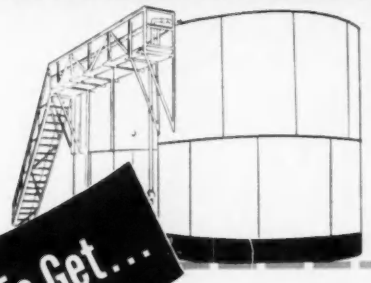

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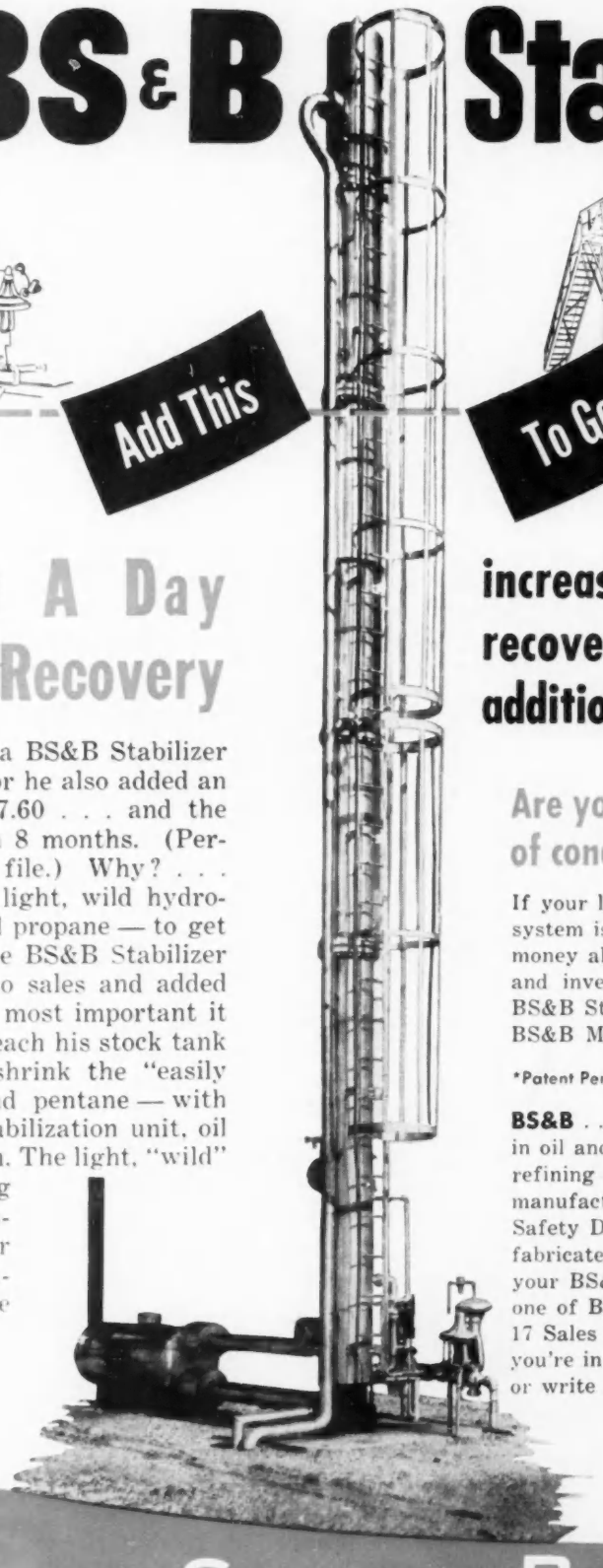

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natural rate, only 23 percent of the initial oil in place would have been produced. With 75 percent of the produced gas returned to the reservoir, 36 percent of the initial oil in place estimated to be produced by the time bottom hole pressure is 300 psia represents a recovery increase of 55 percent.

Inasmuch as revenue and profit comparisons for the two foregoing units have been shown, they will not be detailed for Unit C, but the cooperative gas injection program with the area north of the unit will be discussed briefly.

Total Costs Not Cut

As previously pointed out, the injection facilities can be installed and used at reduced cost because the costs will be shared by the unit and those conducting the program on the north, but total field operating costs will not necessarily be decreased. The reservoir will not necessarily be depleted as efficiently as it would be if the entire reservoir were unitized. It is recognized that independently conducted injection programs do not permit the control of fluid movement essential to insure the maximum ultimate recovery. When the only requirement is that a predetermined minimum amount of gas be injected into each of the separate gas injection areas, a large amount of oil may possibly be left in the reservoir. Maximum recovery from the reservoir can be attained only if injection wells are positioned on a fieldwide basis where injected gas will exert the fullest effect on movement of fluid in accordance with natural pressure gradients.

• UNIT D. Only one working interest owner and three royalty owners are involved in Unit D, which makes it somewhat unusual, though perhaps not unique. Unit D is distinguished also by the fact that there are currently both gas injection and water flooding programs being conducted. Figure 9 is a cross-section of the Oligocene pay sands of the reservoir which shows the position of sands on the flank of a salt dome.

Gross production and revenue for primary recovery as compared to that for the unitized recovery program now in operation for all three sands are shown in Figure 10. One operational feature of interest is being conducted in the upper sand and which probably would not have been attempted if the field had not been unitized. By referring to Figure 10, it can be seen that the gas injection well marked "X" is positioned high on the structure but not at the very crest.

Injected gas will rise by gravity segregation to the up-dip limits of the reservoir marked "Y." In so doing, a half million barrels of oil will be displaced downward to be produced from down-dip producing wells marked "Z." This oil would be otherwise unrecoverable because it is now confined in the irregular wedge points along the pinch-out "Y." The pressure thus exerted by the injected gas, together with a controlled rate of withdrawal from wells "Z," will allow the natural water drive, marked Oil-Water Contact, to encroach up dip at a predetermined rate. At the end a maximum recovery of oil will have been effected from all the porosity lower than the highest structural well "X," and the porosity above this elevation will be filled with gas only.

This production and fuel conservation procedure is calculated to save $788,000 in initial investment expenses and to produce a half million more barrels of oil than would be possible with any other type secondary recovery program. Somewhat similar depletion programs will doubtless be put into operation in the other two sands.

A question may arise as to why unitization was considered when there was no danger of pushing oil into another operator's wells since one operator owned the exclusive rights to search for and recover the oil. The answer is diversity of royalty ownership. It will not matter from which well or wells the operator derives his revenue in a case like this, but an inequity to royalty owners would have resulted without unitization because oil under some of the individual tracts will possibly be pushed to adjoining tracts to be produced. It was cognizance of this situation that led to the formation of the unit.

Two Principal Factors

Attention is directed to two principal factors in connection with Unit D:

1. A unit does not necessarily have to involve huge acreage or a variety of operator ownership.
2. Where a single operator controls all production in a given field the contemplation of a secondary program, because it will entail fluid movements across property lines, should be viewed in the light of protecting the correlative rights of the royalty owners while effecting the maximum oil recovery by the most efficient depletion method which is applicable.

It is becoming more evident every day that unitized secondary recovery programs will occupy a very important part in conserving our nation's oil and gas reserves. The initiative for forming these units must come from within the oil industry, for it alone is best equipped to keep its own house in order. It is unquestionably the responsibility of the oil industry to voluntarily protect the correlative rights of royalty owners. It can hardly be denied that consideration of royalty owner rights in the first instance will diminish to a considerable degree prospective litigation to adjust those rights. Freedom from legal entanglement is a decided economic advantage.

About the Authors

LAWRENCE E. BROCK received BS degrees in petroleum and geological engineering at the University of Oklahoma in 1936. He joined Stanolind Oil and Gas Company in July, 1937, as a roustabout in the Hobbs field. In October, 1937, he was sent to Pampa, Texas, as an apprentice engineer. After several months in engineering work in the division office at Fort Worth, Texas, he was transferred to the Tulsa general office in January, 1941, as a petroleum engineer. In October, 1950, he became unitization superintendent, his present post with Stanolind.

BRUCE A. LANDIS was graduated from Pennsylvania State College in 1948 with a BS degree in petroleum and natural gas engineering and in 1950 from Dickinson School of Law. Landis spent five years in the infantry during World War II. Before joining Stanolind in late 1951, he was employed in the Title and Contracts Department of United Natural Gas Company at Oil City; Penn.

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[2] Ibid.

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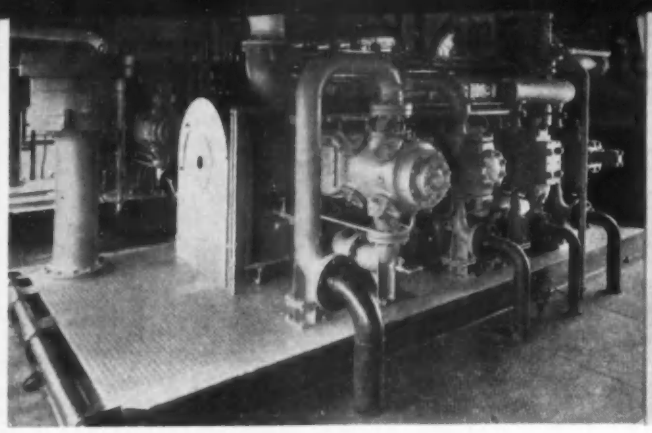
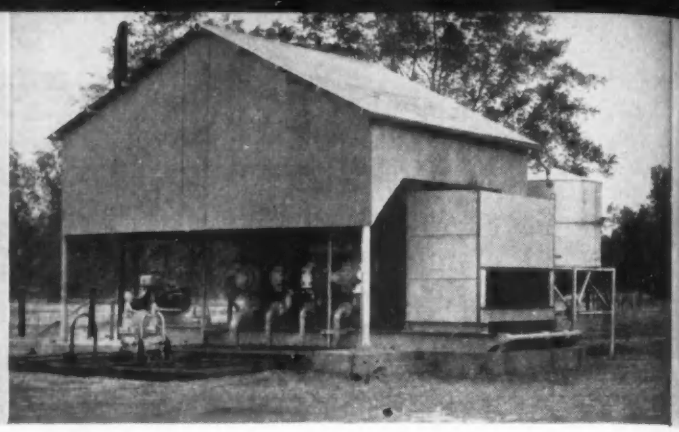


Two Clark Midget Angles furnishing gas for gas lift service and to recycling plant at Cranfield, Miss.



Battery Two, Lake St. John Field, La.: Clark Midget Angle supplying gas to the Lake St. John gasoline and recycling plant.

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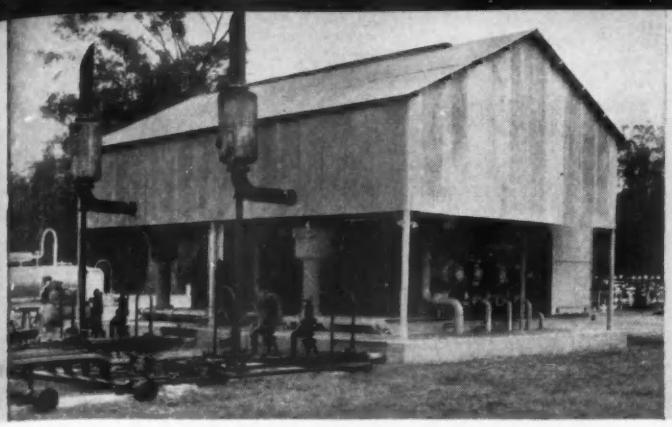

Battery Four in Lake St. John Field, La.: Two Clark Midget Angles furnishing gas for gas lift services and for gasoline plant at nearby Lake St. John.

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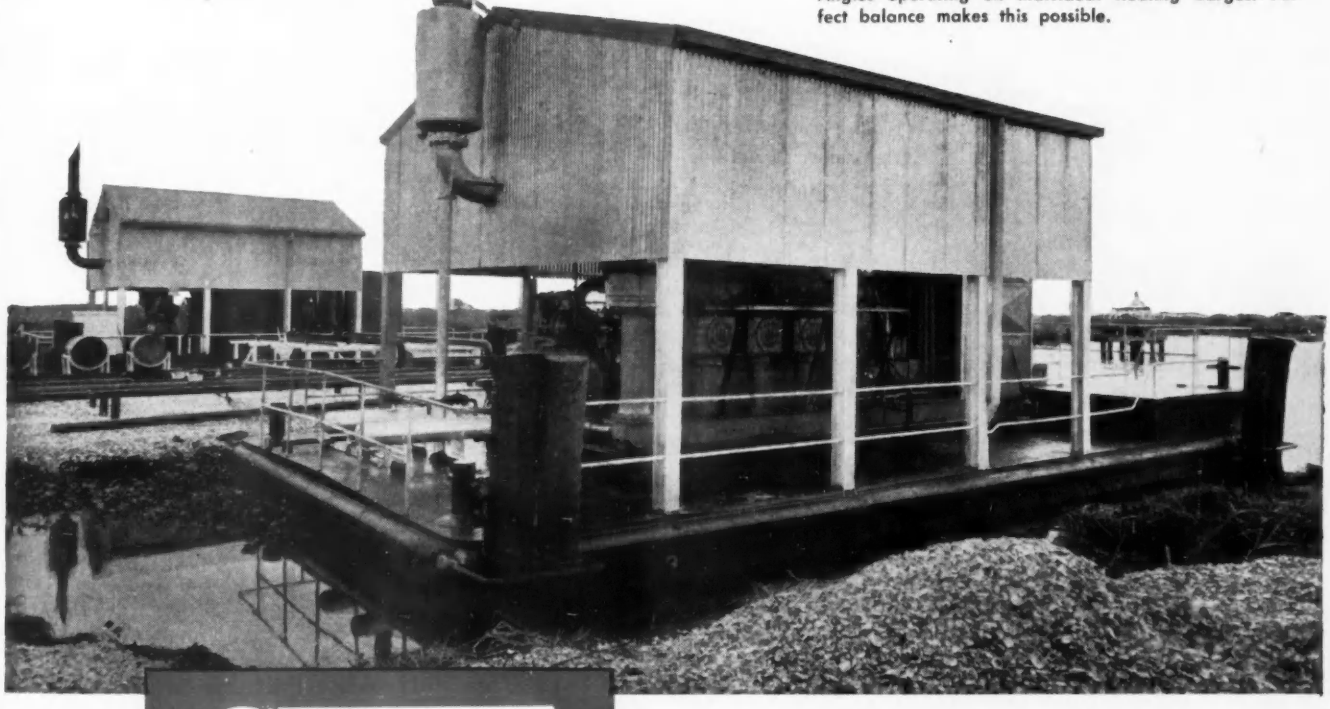

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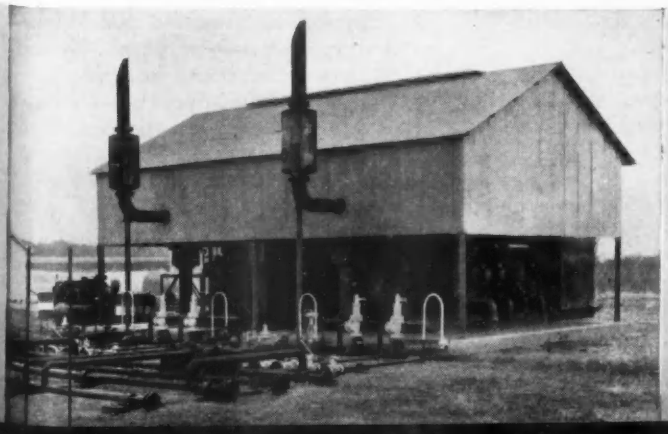
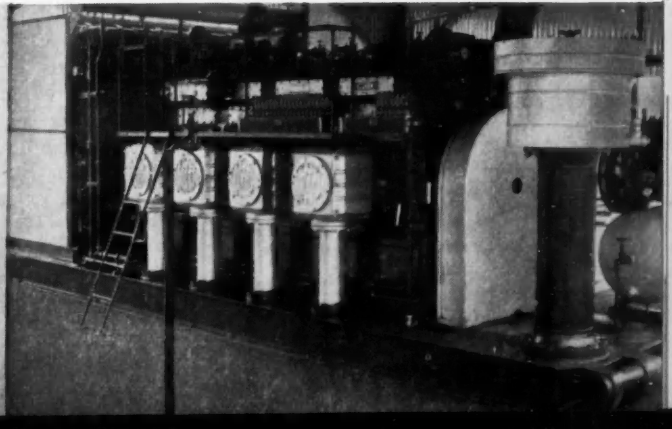
Two Clark Midget Angles supplying gas through 2-pressure services to nearby Lake St. John recycling plant.



Hico Knowles, La.: Clark Midget Angle supplying gas through 2-pressure service for nearby recycling plant.



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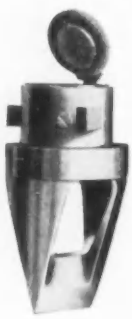

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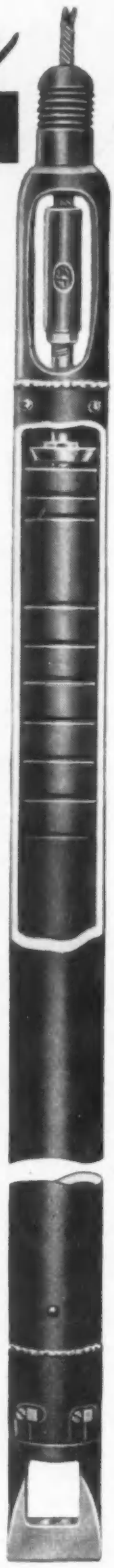

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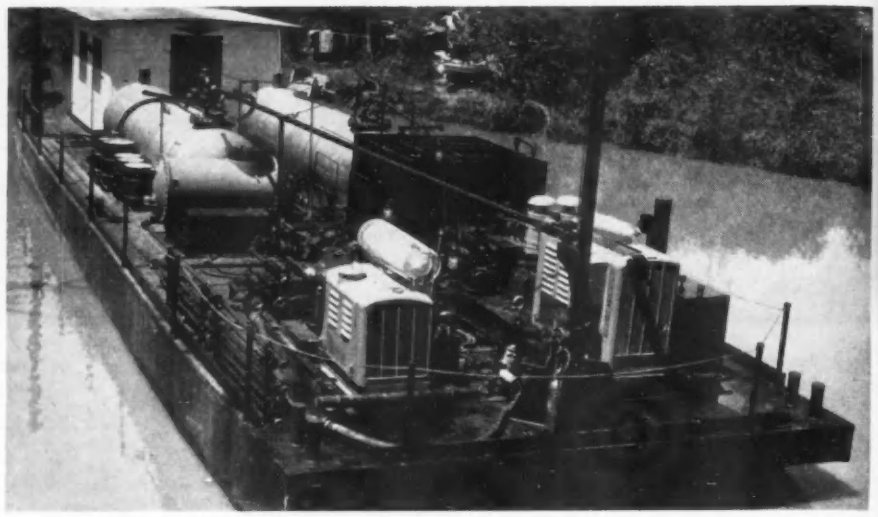

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A NEW shallow-draft barge, first of its kind and containing the most modern equipment has been designed to perform all types of oil well acidizing jobs and sand consolidation work. Operating from loading docks 20 miles south of Houma, La., the barge will service wells in the marshes and bays accessible only by barge or boat. It has no means of propulsion and is moved by a small tug.

This all-steel barge, measuring 22 feet wide and 77 feet long, has storage capacity to complete 12 average acidizing treatments without returning to the docks for more acid. Considerable storage for fresh water is provided below decks, while above-deck storage, as shown in the illustration, consists of two 3000-gallon, rubber-lined tanks for concentrated acid. A small plastic mixing tank (shown just forward of the starboard acid storage tank) is used in preparing plastics for sand consolidation jobs.

Two high-pressure pumps were installed at the forward end of the barge. These are horizontal triplex pumps, having 3¾-inch bore by 5-inch stroke, and having a working pressure of 10,000 pounds per square inch. The starboard pump (left in foreground of photo) is powered by a 100-horsepower diesel engine and the port pump is driven by a 200-horsepower diesel engine.

The barge contains living quarters equipped with kitchen facilities, bunks, change room and small office. Also included are a light plant, an air compressor and two-way radio communications. Shallow draft of the barge allows it to navigate easily in waters of about four feet minimum depth.

Two spuds, located forward and aft, secure the barge in position once it has been spotted at the well site. They are manually operated by hand hoists when the barge is to be moved.

The dark colored tanks on deck (port side) are volume measuring tanks. This assembly includes three tanks: one of 24-barrel and two of 12-barrel capacity. A 2⅞-inch drill pipe boom with a radius that extends back to the volume tanks and storage tanks, was mounted on a base located in the middle of the barge at the bow. The boom is raised and lowered by a hand-operated winch.

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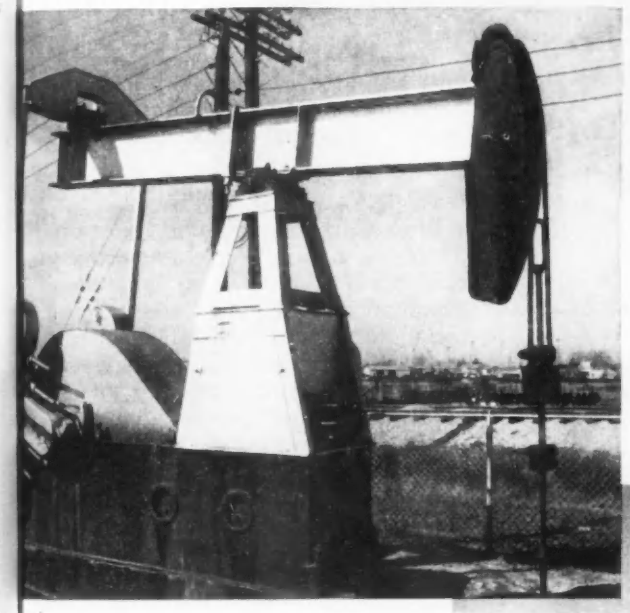
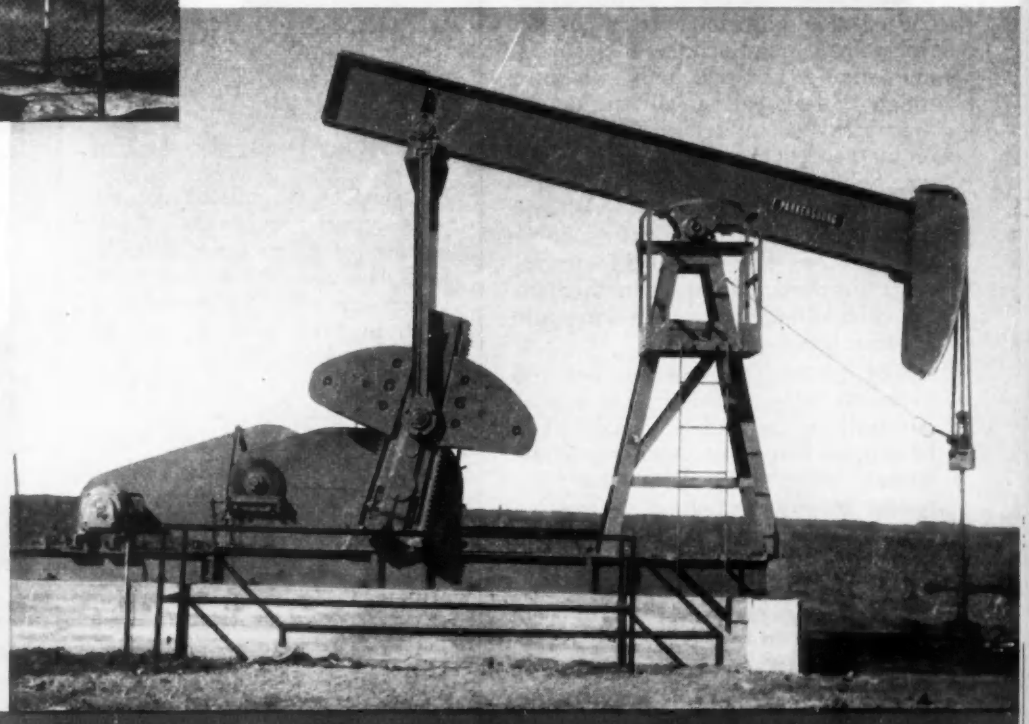


ABOVE — This early Parkersburg Pumper has been operating in the East Texas field at Kilgore for more than 20 years. Still in service today, it is a testimonial to long-life of Parkersburg Pumpers.



RIGHT — Latest type of Parkersburg Chain Driven Pumper on a West Texas location. This 54" stroke pumper is equipped with the new Parkersburg Crank Counterbalance and the newest type of chain drive.

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Depletion Recovery Calculations Simplified

Method of Calculating Gas and Condensate Recovery Has Proven Less Cumbersome and Offers Less Chance for Mechanical Errors

By RICHARD W. HILLYER
Cummins & Brinkerhoff
Houston

DETERMINATION of the recovery to be expected by natural depletion of a volumetric gas and condensate producing reservoir may be accomplished by one of three fundamental methods:

- Physical tests on reservoir effluent in a laboratory.
- Mathematical calculation.
- Assumed behavior based on a parallel reservoir.

The former of these three is the most desirable for accuracy, assuming proper laboratory techniques are employed. The method of assuming recovery based on behavior of a parallel reservoir is questionable in accuracy and should be used only where a rough approximation will suffice. In a majority of cases either laboratory or mathematical predictions of reservoir behavior are required. If laboratory analyses are available, well and good. However in many cases laboratory analyses are unavailable or require supplementation by mathematical calculation, which is a long and arduous task.

The method described is believed to be as accurate as any technique currently in use and is considered to be simpler than most. Accuracy of the method to be outlined here has been tested by comparison of calculated behavior with actual field behavior and proven inasmuch as it is possible to reduce and evaluate other intangibles affecting the variation of field performance from the ideal or calculated performance. It must be noted that these examples do not eliminate the "trial and error" method of flash calculation. They do, however, present a procedure which is slightly less cumbersome than the usual, offers less chance for mechanical error, and results in direct answers without the usual numerous conversions to 100 percent molecular composition.

About the Author

RICHARD W. HILLYER is a petroleum engineer in the consulting firm of Cummins & Brinkerhoff, Houston. He attended the University of Oklahoma from 1940 to 1943 when he entered the U. S. Army. He served three years in the Army and Air Force, receiving the Purple Heart in Italy. He returned to the University of Oklahoma and received his B.S. degree in mechanical engineering in 1947. He worked for The Carter Oil Company in Oklahoma, Illinois and Louisiana, attaining the position of division reservoir engineer in the Southern Division at Shreveport. He received special reservoir training at Carter's research laboratory, and shortly before his resignation in January, 1952, to join Cummins & Brinkerhoff, he assisted in teaching reservoir engineering.

Basis of Technique

Prior to the explanation by example of the natural depletion recovery calculation technique a qualitative explanation is of value. Basis of the technique is the calculation of the hydrocarbons contained within a unit volume of reservoir space prior to and following natural depletion and the determination of total recovery by the multiplication of the difference between the quantities of hydrocarbons before and after production by the total number of unit pore volumes contained within the reservoir. The assumption of constant volume, that is, no fluid influx, is basic to this procedure.

Empirical Example

The following illustration is empirical in derivation. Inasmuch as this discussion will provide the operating reservoir engineer who consistently works under time limitation pressure with a ready set of examples and brief mechanical explanations, the example form of presentation has been used. Quantitative steps employed to effect the calculation of the above explained qualitative method are as follows:

Given: Mol percent composition of the original hydrocarbon mixture in the reservoir; reservoir pressure; temperature and volume.

Desired: Total quantity of each hydrocarbon component of the original reservoir which would be produced by natural depletion,

and quantity of each hydrocarbon component of the original reservoir fluid which would be lost in the reservoir by natural depletion.

Given the following reservoir conditions and reservoir composition:

Original reservoir pressure:
3952 psia

Original reservoir temperature:
248° F.

Original reservoir fluid composition:

Component	*C Mol or Volume Percent*
CO_2	1.868
C_1	75.757
C_2	7.704
C_3	4.440
iC_4	0.886
nC_4	1.827
iC_5	0.848
nC_5	0.761
C_6	1.232
C_7+	4.677
	100.000

1. Calculate the original volume of reservoir pore space occupied by the hydrocarbons in 100,000 cubic feet of sample at standard conditions.

a. Calculate the deviation factor (Z) to be 0.896 by the pseudo reduced method. If available, (Z) may be taken from a laboratory sample analysis.

b. Calculate the percent water vapor of total vapor by Dalton's law of partial pressures or by one of the charts available in the literature.

$$100 \times \frac{\text{Partial Pressure of Water Vapor}}{\text{Total Pressure of Vapor}} = \text{Percent Water Vapor}$$

$$(100)\ \frac{28.82}{3952} = 0.729\%$$

c. The percent hydrocarbons of total vapor equals 100 minus percent water vapor, or in this case $100 - 0.729 = 99.271$ percent.

d. Total original reservoir volume occupied by the hydrocarbons in 100,000 standard cubic feet of reservoir vapor equals:

$$\frac{\text{MCF Hydrocarbon Vapor Per Unit Volume and Reservoir Pore Space}}{\text{Percent Hydrocarbons in Vapor}} \times \frac{P_s}{P_r} \times \frac{T_r}{T_s} \times Z$$

Where P_s = standard pressure (14.696) in pounds per square inch absolute
P_r = reservoir pressure in pounds per square inch absolute
T_s = standard temperature in degrees Rankine
T_r = reservoir temperature in degrees Rankine
Z = deviation factor

Solution of the equation for the example with which we are dealing indicates that the reservoir pore volume originally occupied by the hydrocarbons in 100,000 standard cubic feet of original reservoir vapor equals 455 cubic feet. **This will be the accepted unit of reservoir volume to which all subsequent calculations will be referred.**

2. Flash the reservoir sample composition on a 100,000 cubic feet dry basis to the first assumed drop in reservoir pressure, which is not to exceed 500 pounds per square inch. Inasmuch as the mol percent and volume percent of vapor are equivalent, no calculation to convert mol percent to volume percent is required. (See Table 1.)

3. Calculate the volume of reservoir pore space occupied by the hydrocarbons remaining as vapor from the original 100 MCF of vapor hydrocarbon reservoir sample.

Component	*MCF Hydrocarbons Remaining as Vapor from Original 100 MCF of Reservoir Vapor Hydrocarbons*
CO_2	1.814
C_1	74.206
C_2	7.449
C_3	4.250
iC_4	0.845
nC_4	1.731
iC_5	0.786
nC_5	0.706
C_6	1.091
C_7+	3.721
	96.599

a. Deviation factor (Z) calculated to be 0.872.

b. Percent water vapor = 0.823, therefore the percent hydrocarbons in vapor = 99.177.

c. Total reservoir volume of hydrocarbons remaining as vapor of the original 100,000 standard cubic feet of vapor hydrocarbons equals $\left(\frac{96.599}{.99177}\right)\left(\frac{14.7}{3500}\right)\left(\frac{708}{520}\right)$ $.872 = 0.486$ MCF.

4. It is obvious that the vapor remaining from the original 100 MCF sample has expanded and that the volume which has just been calculated is greater than the original unit volume of reservoir pore space. Therefore, there must be a correction applied to the apparent vapor remaining to obtain the quantity of the original 100 MCF of hydrocarbons which still remain as vapor in the original unit of reservoir pore volume.

This correction is twofold. First, a correction must be made to reduce the remaining vapor space available from the original unit of reservoir pore volume by an amount equal to the space now occupied by "dropped out" liquid. Secondly, a correction must be made for the expansion of the remaining vapor out of the original unit volume which resulted from the decrease in pressure which accompanied production. These two corrections may be made by one calculation and the resulting quantity of remaining vapor hydrocarbons of the origi-

TABLE 1

Component	Mols or Volume in MCF of Original Reservoir Hydrocarbon Sample	(1), (2) K at 3500 psia & 248° F.
CO_2	1.868	1.2
C_2	75.757	1.72
C_2	7.704	1.05
C_3	4.440	0.805
iC_4	0.886	0.735
nC_4	1.827	0.65
iC_5	0.848	0.46
nC_5	0.761	0.46
C_6	1.232	0.278
C_7+	4.677	(3) 0.140
	100.000	

$L/V = 0.036$ $1 + \frac{L/V}{K}$	MCF Vapor Remaining After Flash from 3952 psia to 3500 psia: $\frac{C}{1 + \frac{L/V}{K}}$	MCF Liquid Remaining After Flash
1.0300	1.814	0.054
1.0209	74.206	1.551
1.0343	7.449	0.255
1.0447	4.250	0.190
1.0490	0.845	0.041
1.0554	1.731	0.096
1.0783	0.786	0.062
1.0783	0.706	0.055
1.1295	1.091	0.141
1.2571	3.721	0.956
	96.599	3.401

Gallons of Liquid Remaining After Flash	Cubic Feet of Liquid Remaining After Flash	Pounds of Liquid Remaining After Flash
0.919	0.123	6.260
31.750	4.244	65.564
6.435	0.860	20.206
5.227	0.699	22.074
1.340	0.179	6.278
3.024	0.404	14.706
2.267	0.303	11.786
1.991	0.266	10.459
5.793	0.774	32.018
52.585	7.029	339.752
111.331	14.881	529.103

[1] Carbon Dioxide K from George Granger Brown after Poettmann & Katz.

[2] Hydrocarbon K values from C. E. Webber, "Equilibrium Constants for Hydrocarbons in Absorption Oil," AIME Technical Publications No. 1252, 1940.

[3] K Values for C_7+ from a special chart.

Apparent Density of Liquid at Standard Conditions $= \frac{529.103}{14.881} = 35.556$ pounds per cubic foot.

Pressure Correction = + 2.17 pounds per cubic foot.

Density of Liquid at 3500 psia and 60° F = 35.556 + 2.17 = 37.726 pounds per cubic foot.

Density of Liquid at 3500 psia and 248° F = 31.3 pounds per cubic foot.

Cubic Feet of Liquid Condensed from 100 MCF of Original Hydrocarbons by Isothermal Reduction of Reservoir Pressure from 3952° F to 3500 psia $= \frac{529.103}{31.3} = 16.904$ cubic feet.

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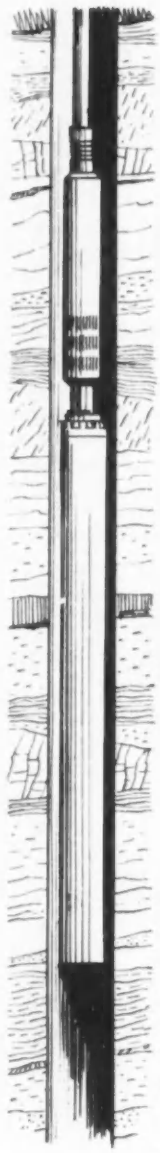

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nal quantity determined as shown in Table 2.

5. Next add the MCF of vapor hydrocarbons of the original 100 MCF which remain in the vapor space of the original unit of reservoir pore volume to the "dropped out" liquid and flash the result to the next downward pressure step of the reservoir and repeat the previous steps to correct the resulting remaining vapor to the quantity and composition remaining in the original unit of reservoir pore volume. (See Table 3.)

6. Repeat the above process for 2500 psia, 2000 psia, 1500 psia, 1000 psia and any other pressure stages desired down to assumed abandonment pressure of the reservoir. Following any flash calculation and the correction of results to the original reservoir volume of pore space it is possible by subtraction of components remaining in place from components originally in place to obtain the quantitative recovery of each component to the pressure of the flash calculation from the unit of reservoir volume under consideration. A multiplication of these unit recoveries by the total number of unit volumes in the reservoir results in the total quantity of recovery of each hydrocarbon component.

It may easily be seen that the calculation of recovery in this manner at an assumed abandonment pressure yields the total recovery to be expected from the reservoir by natural depletion. After completion of the calculation of recovery by natural depletion by the method described it may be seen that it is quite simple to utilize the calculations already performed to construct desired curves illustrating predicted reservoir performance such as percent recovery at any pressure, composition of well effluent at any pressure, and quantity and composition of "dropped out" liquid at any pressure.

TABLE 2

$$F = \frac{V_o - V_L}{V_C}$$

$$F = \frac{455 - 16.904}{486} = 0.901$$

Where F = Factor.
V_o = Original Volume in reservoir cubic feet occupied by 100 standard MCF vapor hydrocarbons.
V_L = Cubic feet occupied by "Dropped Out" liquid.
V_C = Calculated cubic feet volume occupied by vapor hydrocarbons remaining from original 100 MCF of vapor hydrocarbons.

Component	MCF of Vapor Hydrocabons After Flash	x F =	MCF Vapor Hydrocarbons of Original 100 MCF Which Remain in Vapor Space of Original Unit Pore Volume
CO_2	1.814	0.901	1.634
C_1	74.206	0.901	66.860
C_2	7.449	0.901	6.712
C_3	4.250	0.901	3.829
iC_4	0.845	0.901	0.761
nC_4	1.731	0.901	1.560
iC_5	0.786	0.901	0.708
nC_5	0.706	0.901	0.636
C_6	1.091	0.901	0.983
C_7+	3.721	0.901	3.353
	96.599	.....	87.036

SYMBOLS

- C = MCF or MOLS of individual Hydrocarbon components in hydrocarbon sample to be flashed.
- K = Equilibrium constant—ratio of vapor MOLS to liquid MOLS for each hydrocarbon component of total hydrocarbon sample.
- L/V = Ratio of liquid MCF or MOLS to vapor MCF or MOLS of total total hydrocarbon sample.
- F = Factor.
- V_o = Original volume in reservoir cubic feet occupied by 100 standard MCF of vapor hydrocarbons.
- V_L = Cubic feet occupied by "Dropped Out" liquid.
- V_c = Calculated cubic feet volume occupied by vapor hydrocarbons remaining from original 100 MCF or vapor hydrocarbons.
- P_s = Standard Pressure (14.696 psia).
- P_r = Reservoir pressure in psia.
- T_s = Standard temperature in degrees Rankine.
- T_r = Reservoir temperature in degrees Rankine.
- Z = Deviation of supercompressibility factor.

TABLE 3

COMPONENT	C MCF Vapor Remaining	MCF Condensed or "Dropped Out" Liquid	MCF Hydrocarbons in Original Unit of Reservoir Pore Volume	K @ 3000 psi & 248° F.	$L/V = 0.0481$ $1 + \frac{L/V}{K}$	Vapor C / $1 + \frac{L/V}{K}$	Liquid	Gallons	Cubic Feet	Pounds
CO_2	1.634	0.054	1.688	1.39	1.0346	1.632	0.056	0.953	0.127	6.492
C_1	66.860	1.551	68.411	2.17	1.0222	66.925	1.486	30.420	4.066	62.817
C_2	6.712	0.255	6.967	1.11	1.0433	6.678	0.289	7.292	.975	22.897
C_3	3.829	0.190	4.019	0.71	1.0677	3.764	0.255	7.015	.938	29.624
iC_4	0.761	0.041	0.802	0.62	1.0776	0.744	0.058	1.896	.253	8.883
nC_4	1.560	0.096	1.656	0.54	1.0891	1.521	0.135	4.252	.568	20.677
iC_5	0.708	0.062	0.770	0.354	1.1359	0.678	0.092	3.364	.450	17.489
nC_5	0.636	0.055	0.691	0.354	1.1359	0.608	0.083	3.004	.402	15.780
C_6	0.983	0.141	1.124	0.21	1.2290	0.915	0.209	8.587	1.148	47.460
C_7+	3.353	0.956	4.309	0.091	1.5285	2.819	1.490	81.950	10.954	529.479
	87.036	3.401	90.437	....	.....	86.284	4.153	148.733	19.881	761.598

Density at Standard Conditions $= \frac{761.598}{19.881} = 38.308.$
Pressure Correction $= +1.55.$
Density at 3000 psia and 60° F. $= 1.55 + 38.308 = 39.858$ pounds per cubic foot.
Density at 3000 psia and 248° F. $= 34.5$ pounds per cubic foot.
Cubic feet at Reservoir Conditions $= \frac{761.598}{34.5} = 22.075.$

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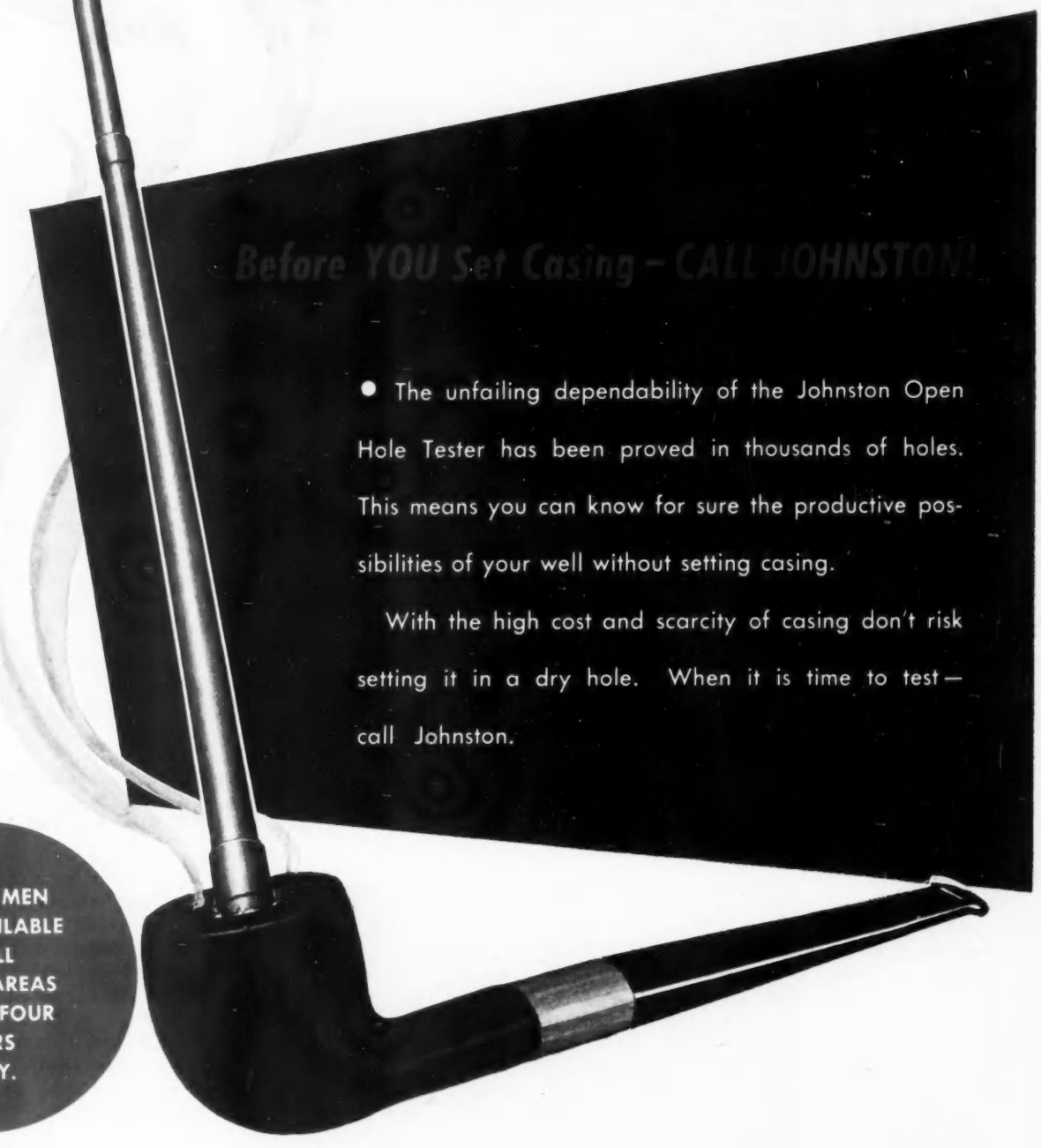

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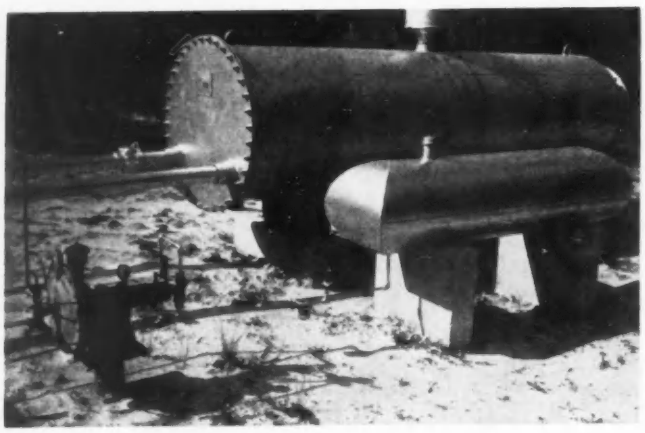
Good Injection System Design Reduces Care

A chemical injection system on a gas line regulator and heater station simplifies and minimizes maintenance of the system. Usually, the chemical injection system must be designed and installed years after the well is producing or after the need for injection is made known. In such cases, the installation may not conform to the best specifications recommended by the manufacturer for maximum efficient service.



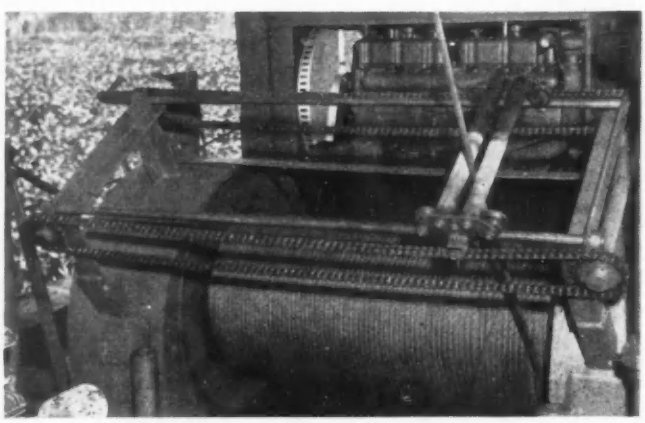
In constructing this regulator and heater station on a gas-condensate line, the chemical injection system was designed and installed along with the other equipment. Result was a neat, efficient system.

This arrangement has many advantages. Absence of wood parts eliminates either painting or need for replacement due to rotting. Foundations for all units—the heater, the chemical reserve tank and the injector pump itself—are well-designed concrete structures. In the case of the pump, a short section of six-inch pipe flanged at both ends raises it off the ground about eight inches.

The chemical supply tank, neatly fabricated from sheet steel, is high enough that the suction of the injection pump is always flooded. It is not too high so that more than just enough suction head is available. Note that there is a strainer on this supply line. The injection pump discharge rises about four inches then makes a return bend, thereby insuring a flooded discharge at all times. Location of equipment makes it easy for the pumper or lease foreman to inspect and service all integral pieces of equipment without the slightest difficulty. Pressure regulator controlling the gas which powers the pump is at a convenient height for regulation.

Manual Wire Line Guide Is Operated Safely

This novel wire line guide was designed so that it could be manually operated in a safe and practical manner. It was mounted on the drum housing of a barge pulling unit that performs such jobs as swabbing, pulling tubing and bottomhole chokes, etc. Near the lower layers on the drum, the wire line spools evenly. But, as the drum fills, the line tends to pile up at one point or another. This unique guide makes it possible for a crewman to stand at one end of the hoist where he can observe the feed of line on the drum and by rotating a crank can guide the wire line wherever desired.



The guide consists of two closely spaced rollers mounted on a four-wheeled assembly that moves back and forth across the drum. The wire line feeds in between the two hard steel rollers. This roller assembly rides on two bar steel tracks that serve as spacers for the shafts mounted at each end.

These shafts are parallel to the roller guides and they are equipped with chain sprockets at each end. Two pieces of endless roller chain fit around the sprockets and are attached to the guide assembly. A crank on one of the shafts (shown at left in photo) can be rotated to move the chain and roller guide assembly.

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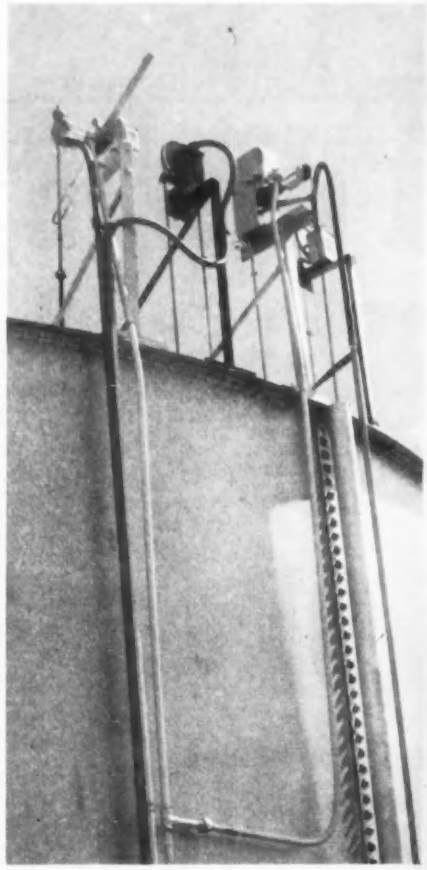
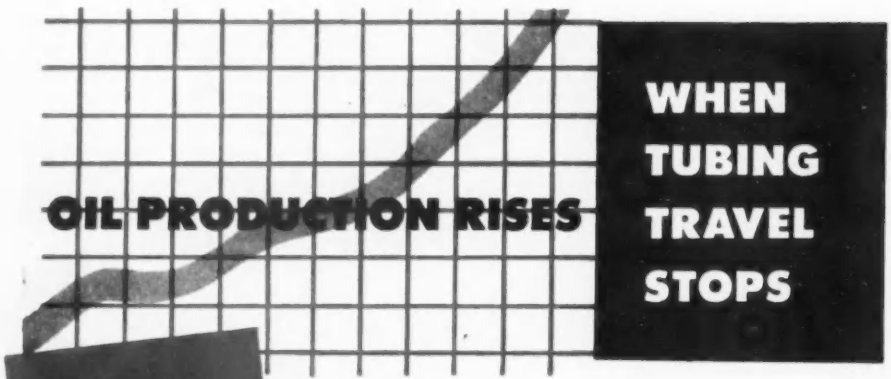


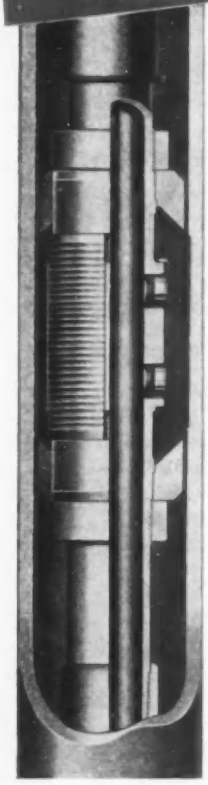
Purpose is to prevent possible precipitation of oxides and growth of algae.

If, for any reason, this tank is not continuously supplied with flood water, the injection pump which operates continuously would soon empty the tank and suck in the oil layer. Air would also be allowed to enter the system, opening up possible avenues for corrosion, precipitation and clogging of the injection system.

Not relying on one water well alone—for they have been known to be pumped dry when least expected—three water wells furnish flood water to this tank. Shown here are four different sets of mechanisms mounted to the edge of the 10,000-barrel supply tank. Each is an electrical switch which starts and stops the electrically-driven water well pump for one of the water wells. Each control is set to start and stop the pumps at different depths of water level in the tank. Should one well become incapable of supplying the water needed, a second well is brought into operation, and so on. The fourth control is to the magneto of the prime mover of the injection pump. Should the water level drop too low, this control will short out the magneto of the gas engine, thus stopping the withdrawal of water from the tank.



stop tubing travel with PAGE type B tubing anchor



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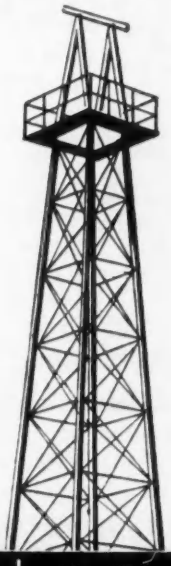
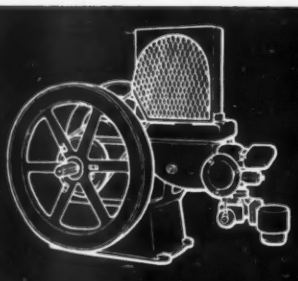
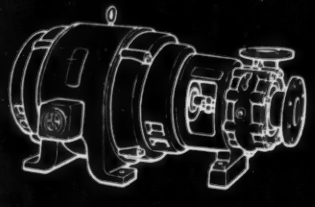


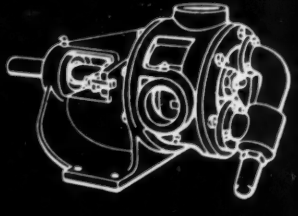
Electric Motors



ZC Engines



Builtogether Pumps

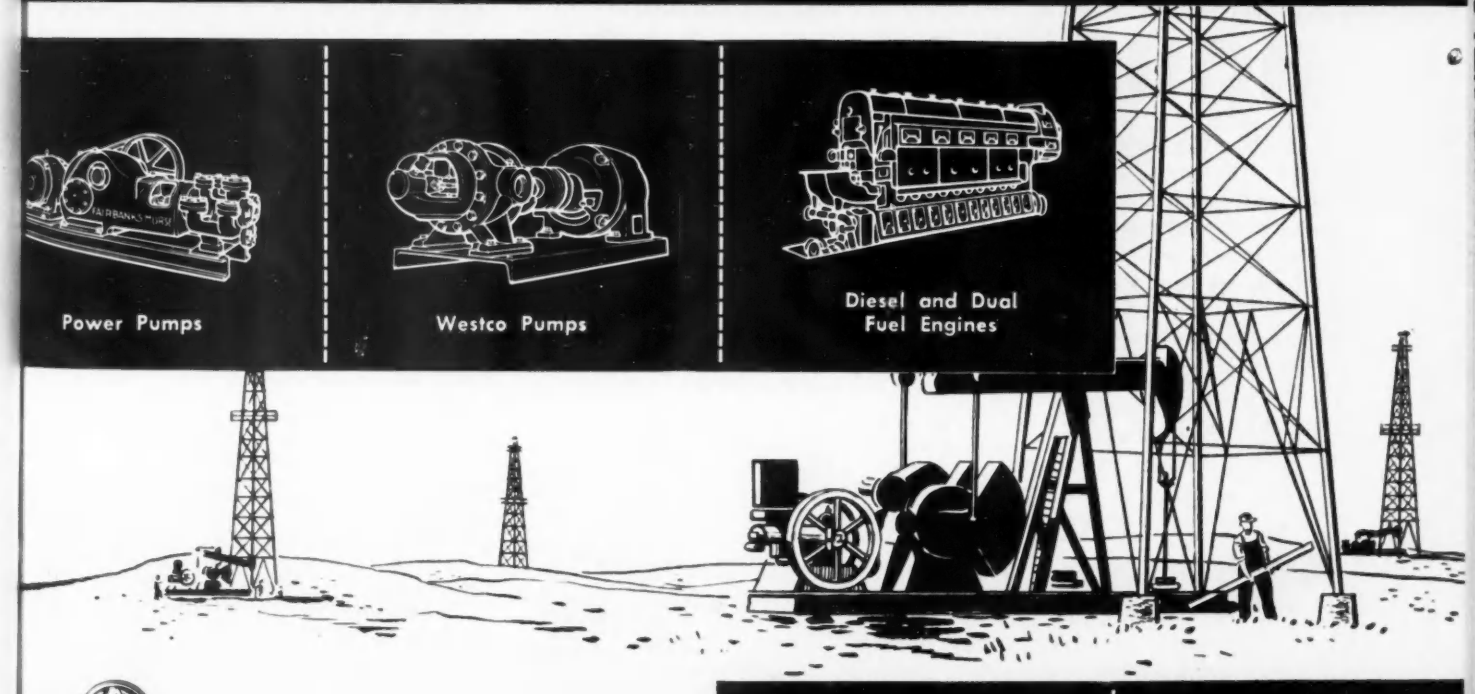


Rotary Pumps

Power Pumps

Westco Pumps

Diesel and Dual Fuel Engines



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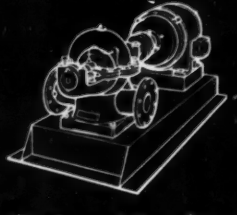
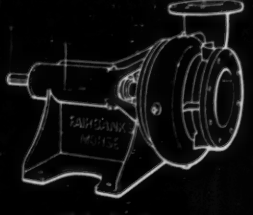


Single and Two-Stage Centrifugal Pumps



Side-Suction Centrifugal Pumps

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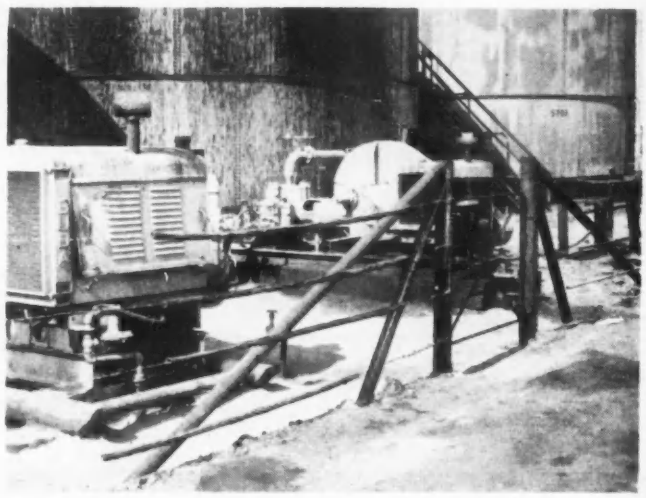

It is sometimes convenient, when overhauling or servicing equipment inside a fenced-in enclosure, to pass tools, equipment, lube oils, etc., through the fence, between the strands of the fence to save having to walk around to the nearest gate. To save time, the workmen may also want to crawl through the fence.

Snagged clothes and scratched arms or legs can be prevented by salvaged rubber hose material, of garden hose size or larger, strung over the barbed wire strands opposite the equipment.

In the installation shown a salvaged piece of hose was cut up into eight-foot lengths and strung over the wires as illustrated. The hose sections in no way affect the utility of the fence as a whole, represent practically no cost, yet serve a useful and time-saving purpose.

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Salt Water Pump Is Extra Efficient

A centrifugal pump and gas engine unitized on one frame for peak performance and convenience was used to transfer salt water from a pit to a salt water disposal well or to another pit located across the lease.

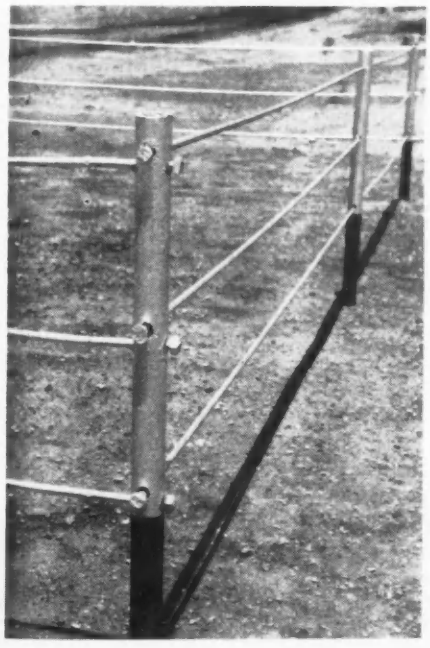
The pump and engine are mounted on I-beam skids with adjustable slots for tightening the V-belts on the driving sheave. A floor and belt guard were installed for safety and to protect the drive from the weather. A

steel rod was welded to both ends of the skid with its topmost part at the center of gravity of the complete unit. This rod facilitates handling the unit in the field with lease trucks when moving from one location to another, or when hauling the complete unit to the shop for overhaul.

The concrete block shown is not required for good performance, but this foundation was poured because the location for the pump and engine was of a semi-permanent nature and the block provided the best foundation for continuous service.

A two-inch rubber discharge hose to handle the salt water and a small rubber hose attached to the gas supply line eliminate broken joints in continuous steel lines due to vibration. A small vent valve in the short suction line at its highest point is used to prime the pump. The standing valve in the gas line eliminates high pressure gas from reaching the engine should the gas regulator fail.

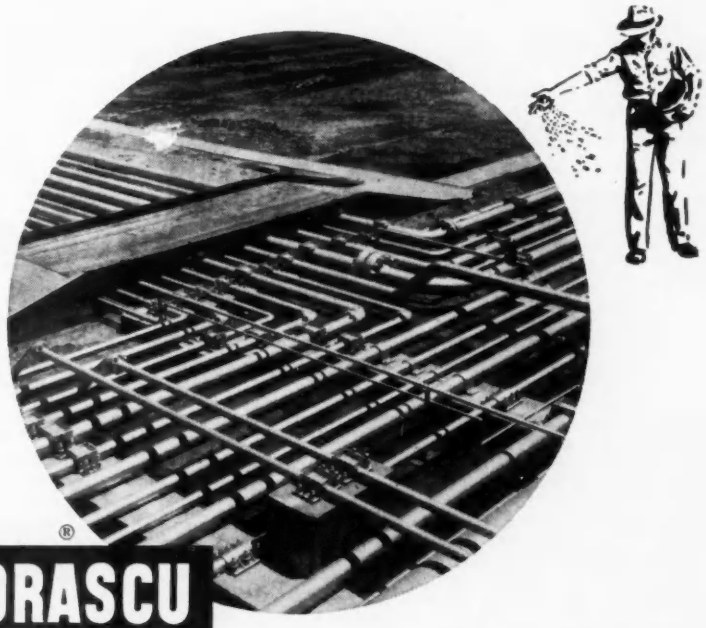
Sucker Rods Used For Simple Fence



By taking advantage of the upset at the ends of the sucker rod material used for fencing in producing well locations, a company in West Texas saves about one-half the welding or threading that generally would be required.

Round holes torch-cut in the two-inch pipe corner posts are held to a diameter just large enough to permit passage of the sucker rod but not large enough to pass the O.D. of the upset portion. This permits each "strand" of the fence to be pulled up snugly and with only a single nut that is run up on the other, threaded end of the rod.

More time can be saved by welding a threaded stud of similar diameter to the take-up end of the rod. Personnel time can be saved by supplying the crew with ready-made studs when the rods are strung through the posts and exact lengths determined, they can be trimmed as necessary and the threaded studs welded on. A minimum of crew field time is required at each location.



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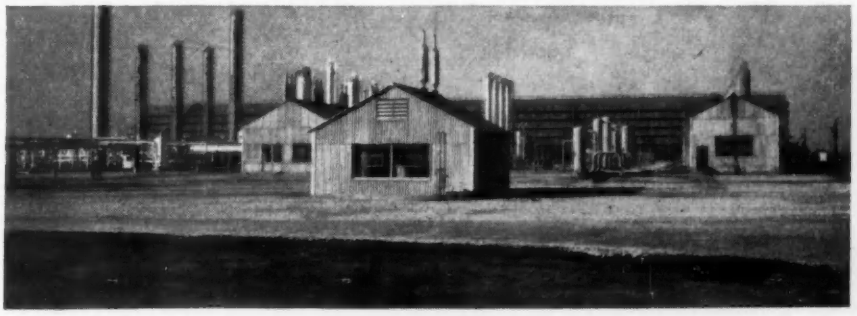

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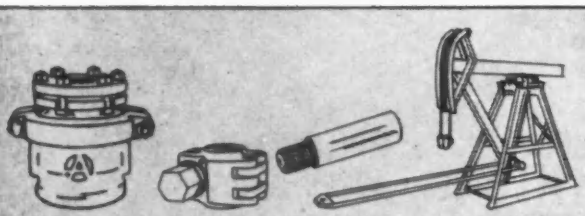

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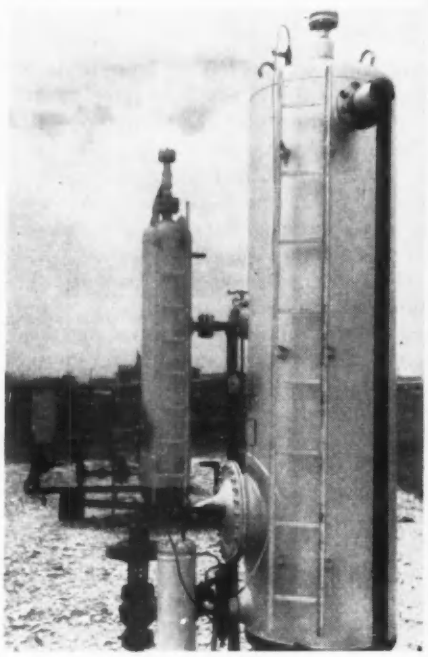
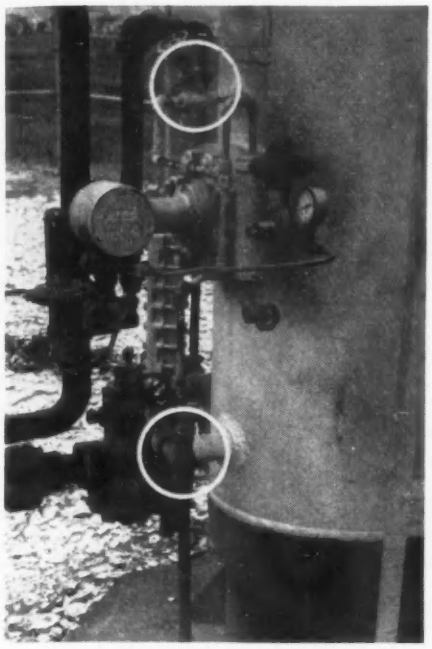


Low-pressure separator can be supplied control gas pressure from high-pressure unit in background, through filter unit near low-pressure separator.

Separator Yields Lease Control Gas

Gas pressure to put control equipment into action and dump the low-pressure separator can be supplied from the high-pressure separator on this two-stage separation lease system. This is a one-well lease where well head pressure is about 1050 pounds and two-stage separation was used. In each case, gas pressure for the control devices is supplied in normal operation by each separator. In the case of the high-pressure separator, gas is supplied through a small line welded into the separator as shown by the valve in the upper white circle. This valve regulates gas that actuates the dump valve on the high-pressure unit. Liquids are dumped into the low-pressure unit before flowing into stock tanks. Pressure in the low-pressure separator is about 50 pounds, enough to force the liquids into the tanks.

However, when the well is shut in for any reason, and the gas pressure inside the low-pressure unit escapes, the separator will not dump because there is no control gas pressure, and there is not enough pressure to push oil from the separator into stock tanks. When the well is opened again gas pressure from the high-pressure



Top circled valve controls gas to high-pressure dump valve. Line welded directly into body of separator. Lower circled valve controls delivery of gas pressure to low-pressure separator.

unit can be supplied to the second unit by a small line connected to the control supply system of the first separator. The control valve to this line is shown in the lower circle of the illustration. Since the gas may contain moisture or liquids, a filter was installed in this auxiliary supply line feeding gas to the low-pressure unit. Once pressure builds up to about 50 pounds in the second vessel, it will automatically take care of itself. But until that time the controls and the dump valve will not operate. Once the unit is in operation, the auxiliary line can be shut off, as the high-pressure unit will feed needed pressure to the low-pressure separator as the former dumps into the second vessel. This unit has overcome a troublesome problem in lease operation due to shutting in the well.

Guide Helps Rack Pipe at Warehouse

A bookend-like device is a simple and inexpensive method of making sure that a carefully stacked string of line pipe, or similar small diameter pipe, will not collapse.

Several supporting units of the type shown are placed on the timbers across which the pipe is laid. Each unit consists of a short length of flat

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"Fig. 600 makes up faster and seals better than any union we've ever had."

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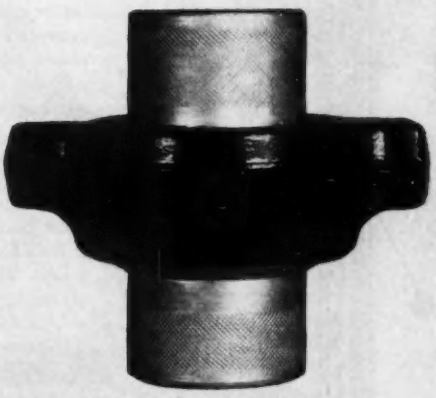

This Union is ideal for pump manifolds – blowout preventer lines – mud lines – stand pipe connections – high pressure separator lines and other high pressure connections.

The replaceable bronze seat prolongs its use far beyond the normal service life of ordinary unions. It assures a seating surface unimpaired by rust on lines involving condensation.

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in 5 plunger-barrel types

This special rod pump is designed to prevent the plunger from becoming sand-locked during shut-down periods — thereby reducing pump failures and excessive pulling jobs. The discharge of the pump is completely enclosed by a long, reciprocating outer jacket tube which protects the plunger from being directly exposed to settling sand and well trash in the fluid column. During the pumping cycle, fluid is discharged from the barrel tube through ports, downward into the annulus between the outer jacket tube and the barrel. The pump's small bore is also especially suited to slow pumping of low-fluid level wells. The pump is a bottom-hold-down, stationary barrel type (A.P.I. RWB), and is available in 2" x 1 1/16" and 2 1/2" x 1 1/2" sizes.

5 types of plunger and barrel tube combinations for various well conditions are offered: H-F Precision and H-F Tuff-Temper Plungers and Barrel Tubes, H-F Flexite Ring plungers, composition ring plungers, and 4-, 6-, and 8-cup plungers. Heat-treated, chrome-plated, and honed and polished barrel tubes of finest quality cold-drawn seamless steel can be furnished for all assemblies.

Harbison-Fischer pumps and related production equipment are sold from stock by leading stores in all major producing areas. Illustrated bulletins on this and other H-F pumps are available without obligation by writing us at Box 64, Ft. Worth, Texas.

Harbison-Fischer Mfg. Co.

"Best Pumps in the Oil Patch"

steel plate on which is welded, in an upright position, a 12-inch nipple of two-inch pipe. This nipple serves as a socket in which can be placed a 1½-inch pipe of whatever length may be desired, depending upon the ultimate height of the stack. The socket is braced on the back side with a flattened nipple or any convenient piece of material.

The shoe of the support is placed beneath the first row when racking is started; the weight of the succeeding tiers holds the unit firmly in place.

Shields on Valves Protect Personnel

To protect personnel or passersby from possible injury should a shear relief valve pop off, one company provides each valve with a short pipe nipple or "jacket" which limits the side travel of shear pin fragments. As a safeguard that the protective nipple will not be accidentally knocked off at any time before, or at the time a valve pin shears, a hand-tightened set screw is installed in the side of each nipple.

The set screw consists of welding a square nut over a hole burned in the side of the nipple, then screwing in a bolt until it contacts the body of the valve. It is tightened with the aid of a wide grip which is welded to the head of the bolt, enabling a man to apply considerable pressure to make sure the bolt is pulled up snugly against the body of the valve.

The jackets are not difficult to

They meet every pumping requirement

From medium-pumping duty in wells which are non-corrosive to heavy-pumping duty in corrosive wells—that's the range of well conditions which can be met successfully when you use Bethlehem Sucker Rods.

Bethlehem Sucker Rods have what it takes for dependable service in varying well conditions because each of the four individual rod types is manufactured with extreme care from quality steel.

The Bethlehem X, XX, and X2 Rods are fully normalized. The Bethlehem "46" Rod is fully normalized and fully tempered. During the normalizing operation, a quick pull-out mechanism transfers each rod from the furnace to the cooling bed. This method of manufacture ensures a uniform air-cool and arms each rod with the mechanical strength needed to resist continual fatigue-action.

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Full data about Bethlehem Rods and accessories can be obtained from the nearest Bethlehem sales office or sucker-rod distributor. Or write direct to us at Bethlehem, Pa.

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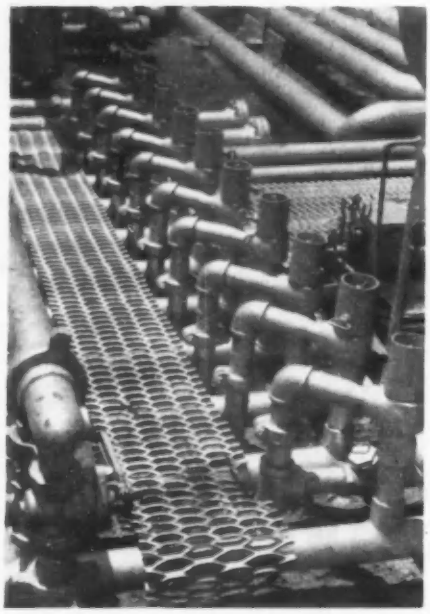
BETHLEHEM *Sucker Rods*



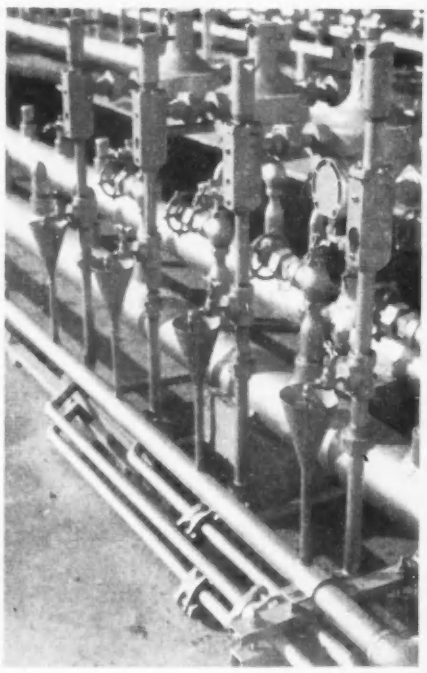
make up in the shop and, when made in quantity for installation on a manifold system, represent comparatively little cost, particularly when compared to the possible dangers if the valves were left uncovered.

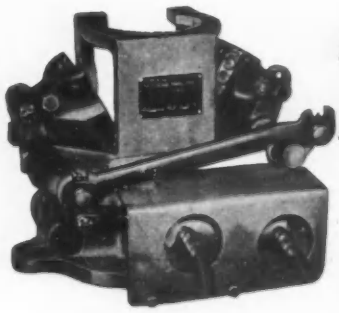
Waste Oil System Removes Hazard

To eliminate a fire hazard and much unsightly splashing of oil in the vicinity of sample cocks on a production metering manifold, one company has built an effective, though relatively inexpensive, gravity waste collection line.

Paralleling the manifold on the outside edge and directly beneath the row of sample cocks, is a two-inch waste line, perforated at intervals with holes in which are welded short half-inch collars. A pipe nipple, to which is welded a fabricated light sheet metal cone, is screwed into each of the collars.

The resulting installation is neat and effective in salvaging otherwise lost oil, as well as reducing the amount of painting or cleaning ordinarily necessary to clean up oil splashes.





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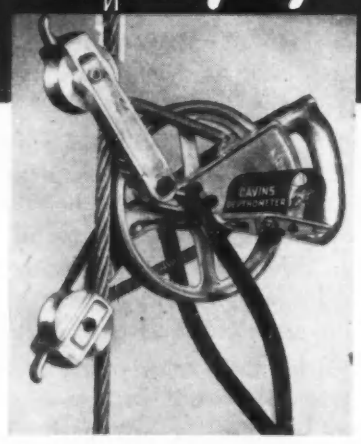

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Covering Wellhead Guards Passersby

A cage-like assembly made of pipe and angle iron was placed over a high-pressure well located in a public area. It is only natural curiosity for people to want to investigate the workings of a "fabulous" oil well. And when that well is situated where the operator cannot effectively fence out the public, other measures must be taken. A movable cage, completely surrounding the christmas tree of the well, was fabricated from steel to prevent any possible entrance except by authorized personnel through the locked door. The cage assembly was heavy enough to prevent its removal by one or two men. It is removed by a winch truck when the well must be tested, bottom hole instruments run, or when it is worked on.

Important Features of JENSEN UNITS

The man who likes to know what makes a JENSEN UNIT tick will be interested in many things about 'em! Such as the one-man combination counterbalance. Or the new gear reduction that enables a man in the field to change quickly from single-reduction to double-reduction, or double to single.

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BROS. MFG. CO., INC., Coffeyville, Kansas

EXPORT OFFICE: 50 CHURCH ST., NEW YORK CITY

Shopmade Wrench Operates Valves

Opening and closing plug valves on flow lines in tunnels or cellars often involves lifting heavy, expanded metal floor gratings to get at a valve. There is further complication when the valves are of more than one size or type and more than one wrench must be used. One production department has found that considerable time and effort can be saved by a tool like the one shown.

Welded to one end of a convenient length of 1½-inch pipe is the square wrench end of the plug valve wrench. Six or eight inches up from that point is welded a handle. In like manner, the other size wrench is welded to the other end of the extension pipe.

Flexibility and economy governed the design of Houston Pipe Line Company's . . .

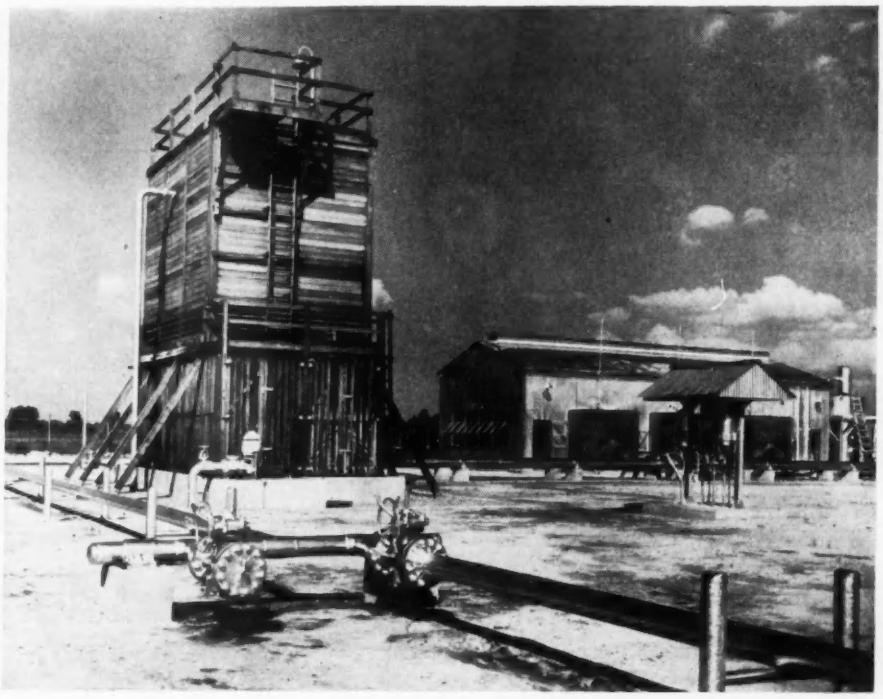
Vest Pocket Compressor Station

By J. R. WAITE, JR.
Chief Engineer
Houston Pipe Line Company

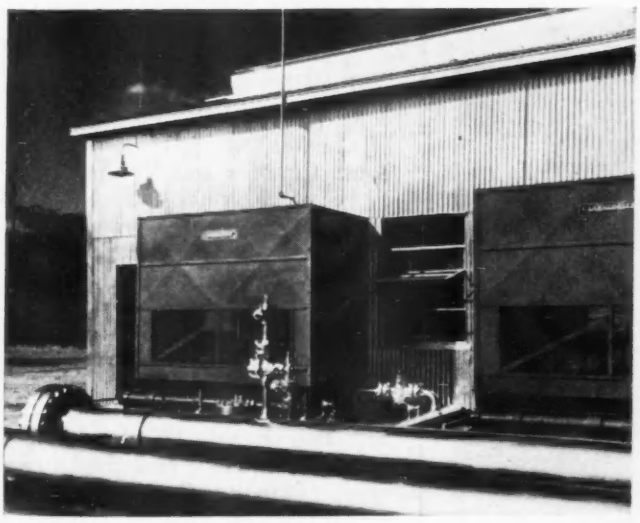
A VEST pocket compressor station, just beyond the outskirts of Houston, is running at capacity, compressing 15 million cubic feet of gas every day for storage in the gas cap of Bammel oil field.

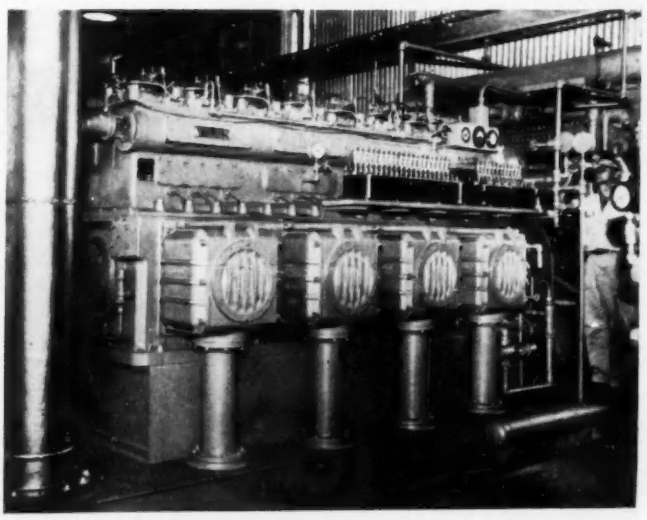
Gas from Village Mills field in East Texas enters the station at a pressure of 385 pounds per square inch. In the station, the slightly wet gas is compressed to 1200 psi, cooled and then discharged into a nearby recycling plant. This plant strips the gasoline from it, boosts the pressure still higher and injects it into the gas cap which blankets the 6000 feet deep Bammel field.

The purpose of this operation is to enable Houston Pipe Line Company



Vest pocket compressor station near Houston compresses gas from Village Mills field in East Texas from 385 psi to 1200 psi. Gas is cooled from 285 degrees to 85 degrees in open cooling coils mounted in cooling tower at left. Compressed gas goes through line in foreground to recycling plant where it is stripped of gasoline. Then gas is stored in Bammel gas cap along with recycle gas.





LEFT. Engine jacket water and lube oil are cooled in these sections mounted on side of building. Blowers in each cooler are driven by V-belt arrangement from flywheel. Efficiency of coolers is not affected by direction of wind. Air enters from sides and is discharged from top.
RIGHT. One of three 330-horsepower compressor engines. Four scavenging air cylinders shown are opposed by four compressor cylinders. This cuts down vibration. Skid-mounted engines are bolted to two-foot thick concrete mat. Entire engine and compressor assembly can be moved in minutes.

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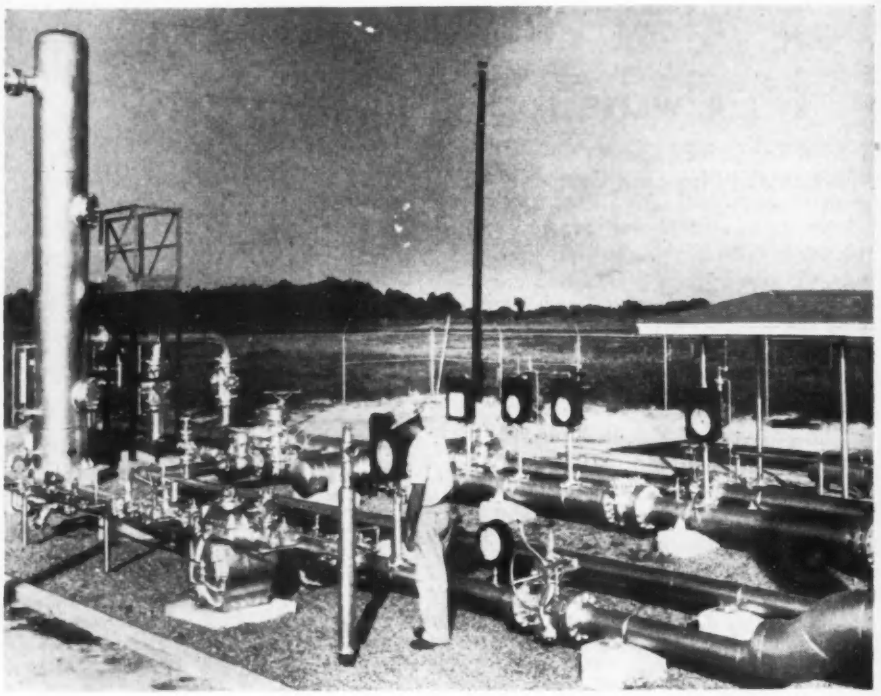
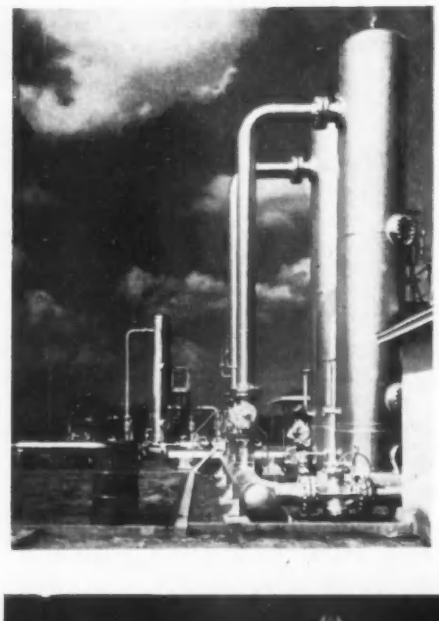
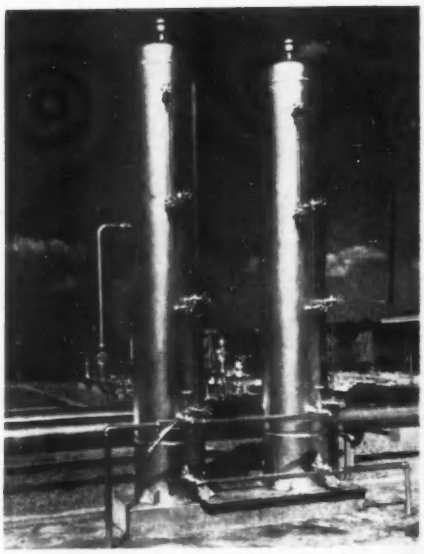


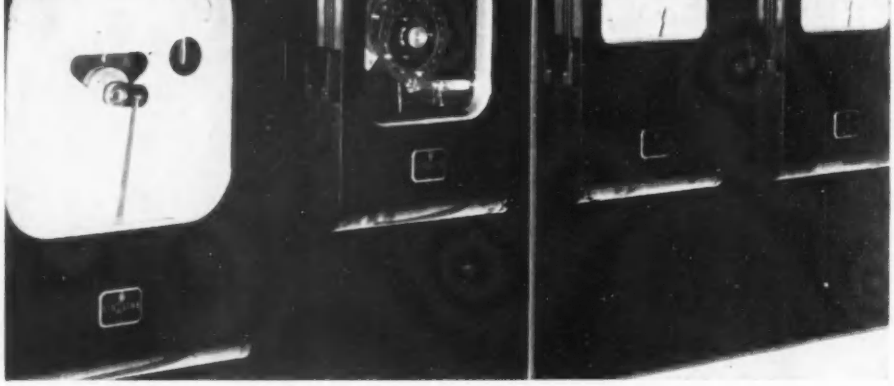
RIGHT. Meter runs and inlet scrubber. Gas enters plant through scrubber at left at rate of 15 million cubic feet a day. When cold weather causes sharp rise in pipe line load, flow is reversed. Gas stored in Bammel field flows back down pipe line and into system, measured through two lines in right background.



LEFT. Gas from Bammel storage can be withdrawn at rate of 150 million cubic feet per day. Scrubbers at right collect condensate as well as dust. When withdrawals are made, gas first comes from injection wells. As demand rises field wells are tied into line.

RIGHT. Lube oil storage tanks made from 12-inch pipe could be easily salvaged by turning them into pipe line drips.





Remote control instruments at Bammel station. Two instruments at left telemeter line and field pressure to dispatcher's office 30 miles away in Houston. Two instruments at right enable dispatcher to control amount of gas being withdrawn from Bammel field.

About the Author

J. R. WAITE, JR., is a graduate of Clemson A. & M. College of South Carolina and for the past 19 years, with three and one-half years out for service as an officer with the U. S. Navy during World War II, he has held high positions with United Gas Pipe Line Company, J. S. Abercrombie Oil Company, Texas Eastern Transmission Corporation, Pan American Pipe Line Company and Fish Pipeline Construction Corporation. He is now chief engineer of Houston Pipe Line Company. He is a registered professional engineer, State of Texas, and a member of the American Society of Mechanical Engineers.

LEFT. In dispatcher's office, weather reports of southern part of U. S. are received via teletype every hour. Because industrial boilers in market are not insulated or housed, a rain or sudden cold can send demand soaring. Dispatcher must anticipate and counter demand with more gas. CENTER. By a flip of switch and twist of dial Dispatcher Bill Walker can set distant control valve to raise or lower flow of gas from Bammel field. RIGHT. Ed DeMouche, superintendent of gas control, points to chart which shows change in field pressure effected by operation in center picture.

to meet the peak winter demand of its number one customer, the City of Houston. For the most of the year this city swelters in an almost tropical climate. Little gas goes into heating of homes. And boilers and heating equipment in the hundreds of nearby chemical and manufacturing plants, which are Houston Pipe Line's customers, are not housed or heavily insulated. Yet nearly every winter brings freezing temperatures. The rain and cold send fuel demands soaring. In extreme cases Houston Pipe Line Company must double deliveries to meet the demand.

At such times, the withdrawals from the gas cap storage will exceed the daily input rate by 10 to 1, or about 150 million cubic feet of gas per day. In case the extreme demand continues, more gas may be removed from the field than was injected into it on a daily basis. This will mean using a portion of the gas from the field which is in the process of being recycled.

The Compressor Station

The compressor station is the nucleus of the storage system. Two factors strongly affected its design. The first was flexibility. The station had to be arranged so that it could be handled by a single operator. Furthermore, this operator should be able to change direction of flow in a few minutes. Also the compressing units had to be sized to take wide variation in load.

The second factor which affected the design was economy. Since Houston Pipe Line's operations are 100 percent intrastate, they are not regulated by the Federal Power Commission. Its earnings are not based on dollar valuation of plant account. In fact, high dollar valuation of plant account is not necessarily advantageous. Thrift in design and construction represented an old-fashioned savings.

For this reason, the entire plant was designed with ultimate salvage in mind. For example, the three compressors and engines are skid mounted. They were installed by bolting them to the two-feet-thick concrete mat. They can be removed in a matter of a few minutes by simply unbolting them. Their size makes them useful in any number of installations. A second example of economy in design is the lube oil storage tanks. They were made up as vertical vessels from 12-inch pipe with weld caps at each end. They can be easily and quickly converted into pipe line drips. They are sized to fit almost any of the company's lines.

In appearance, the station is a miniature of the large transmission pipe line compressor stations which are becoming common today. The station has above-ground headers, a cooling tower for cooling discharge gas, atmospheric coolers for engine jacket water and lube oil, and two sets of scrubbers.

One of the scrubbers is used to clean incoming gas before it is compressed. The other scrubbers are used to clean the field gas before it enters the company's system and to collect condensate in case the gas from the field is wet.

The latter scrubbers are necessary because of the pattern followed in withdrawing gas from the field. The first supply of gas comes from the two injection wells. These wells will produce the dry gas which has been injected into them. However, if these wells fail to meet the demand, field wells will be turned into the system. And since this gas is somewhat wet, it was necessary to take steps to collect condensate and prevent freezing.

Pressure Cut

There is little chance of freezing at any point except the well heads. Here the gas is reduced from 1200 psi to 800 psi. At this point it passes through heaters and then on to the station. Here a remote controlled regulator cuts pressure from 800 psi to 750 psi line pressure.

This regulator is controlled from the dispatchers office in Houston, 30 miles away. Electrical instruments telemeter field gas pressure and line gas pressure at alternated 10 minute cycles. The dispatcher can re-set the pressure by simply pressing a button and turning a dial. Effects of this operation can be felt seconds later.

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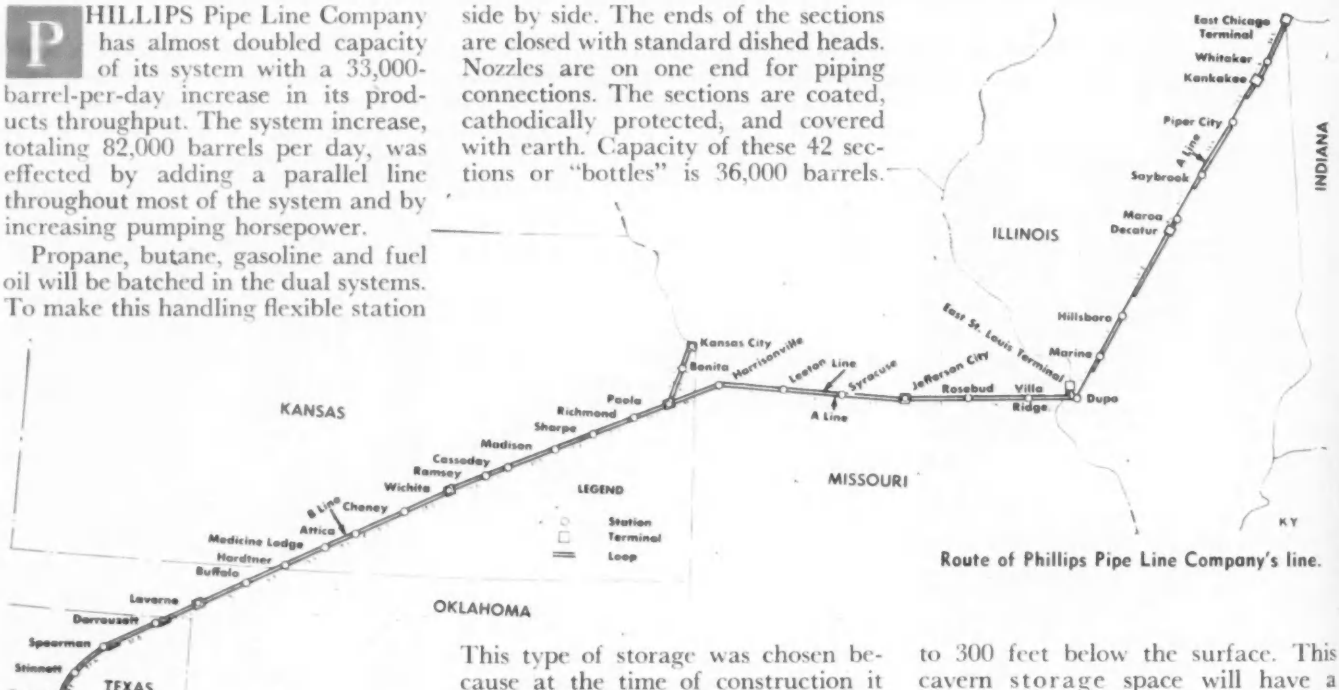
Phillips Expands Products Lines

82,000-Barrel-per-Day Increase Effected By Adding Parallel Line Throughout Most of System and Hiking Pumping Horsepower

By ANTHONY GIBBON
WORLD OIL Staff

PHILLIPS Pipe Line Company has almost doubled capacity of its system with a 33,000-barrel-per-day increase in its products throughput. The system increase, totaling 82,000 barrels per day, was effected by adding a parallel line throughout most of the system and by increasing pumping horsepower.

Propane, butane, gasoline and fuel oil will be batched in the dual systems. To make this handling flexible station pumps are manifolded so they can be tied to either or both of the pipe lines.



Route of Phillips Pipe Line Company's line.

One of the outstanding features of the expansion program is the propane storage. At Borger, southern terminus of the line, propane is stored in 45 horizontal cylindrical pressure vessels with a combined capacity of 64,000 barrels. In addition, two underground storage caverns in salt formations have been completed nearby for seasonal use. These spaces were formed by completing a conventional well at the top of salt formation, and then circulating water to remove salt. Each of the two wells has a capacity of approximately 50,000 barrels.

At Paola, Kansas, the storage is of another type. There are 42 sections of 30-inch pipe, each 1143 feet long, laid side by side. The ends of the sections are closed with standard dished heads. Nozzles are on one end for piping connections. The sections are coated, cathodically protected, and covered with earth. Capacity of these 42 sections or "bottles" is 36,000 barrels. This type of storage was chosen because at the time of construction it was impossible to obtain the heavy steel plate which would be required to fabricate conventional pressure storage vessels.

At East St. Louis, nine ordinary horizontal pressure storage tanks have been installed with a total capacity of 12,800 barrels for storage of propane.

Three types propane storage was used at Kankakee, Illinois. (1) Eleven conventional pressure vessels were installed. They have a total capacity of 6800 barrels. (2) There are 44 of the 30-inch diameter pipe sections, each 970 feet in length, having a total capacity of 30,600 barrels. In addition, an underground cavern storage space is being completed at Kankakee. This is a space which is being excavated by conventional mining methods in a gas impervious shale formation at a depth of about 250 to 300 feet below the surface. This cavern storage space will have a capacity of approximately 250,000 barrels of propane when it is finished.

Since the specifications for LPG propane are very strict, great care has been provided in handling this product to insure its purity. At Paola and St. Louis the propane is taken off in the middle portion of the slug to avoid any contamination with adjacent batches.

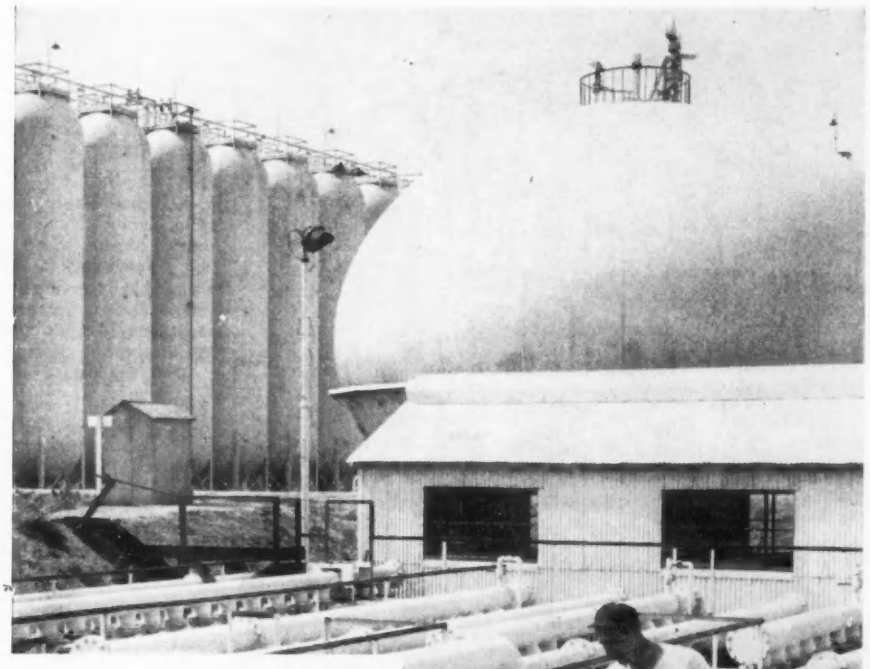
Both the front end and the back end of each slug go on to Kankakee where a fractionator has been installed to rerun them and separate the propane from commingled products. Small dehydrators remove any traces of moisture which would affect specifications.

Although the provision of facilities to handle propane and the increase in pipe line capacity are the major features of the current expansion there were included several other items

which are also of interest. Storage of the ordinary products such as gasoline and kerosine at the eastern terminals was increased by the addition of one 125,000-barrel storage tank, six 80,000-barrel tanks and one 40,000-barrel tank.

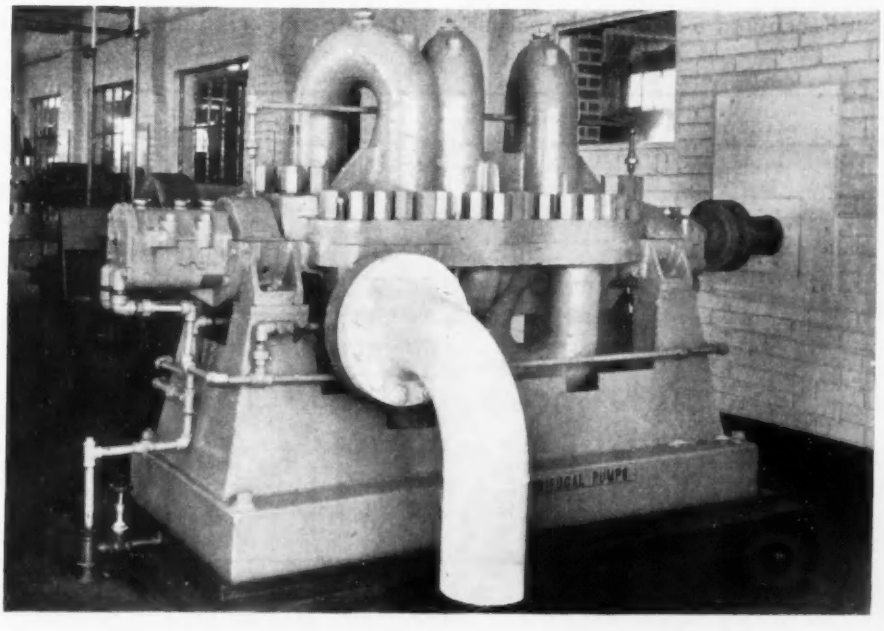
For operational purposes the pipe line network is broken down into five major sections; Borger to Paola; Paola to Kansas City; Paola to East St. Louis, East St. Louis to East Chicago, and Borger to Denver.

The section between Borger and Paola, a distance of 416 miles, now consists of two separate pipe lines. One is the original 8-inch line with pumping units at 15 locations. The other line consists of 253 miles of 8-inch pipe formerly used as partial loops for the original line, and 163 miles of 12-inch pipe which has just

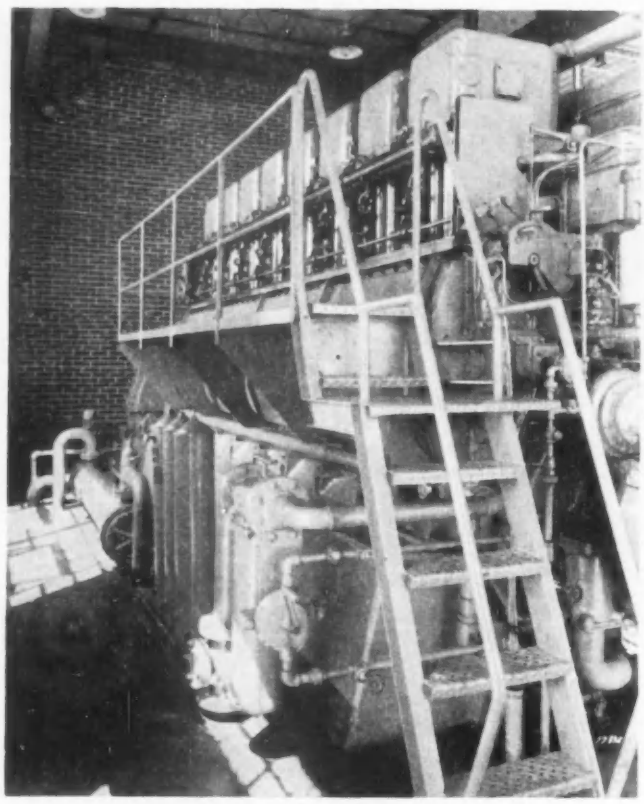


ABOVE. Operator opens valves at East Chicago to move gasoline from storage tank. Blimps at left contain butane.

ABOVE. Rocky Station, part of products pipe line terminal near Phillips, Texas, is beginning of Denver line.



RIGHT. Pump room. Mechanical seals make propane handling safe. Note drive shaft coming through wall.



A 1210-horsepower, four-cycle, dual fuel engine at Sharpe, Kansas, pump station. Engine jacket water is cooled by incoming products in heat exchanger. Supercharged air is cooled before entering power cylinders.

been added to complete the second line. To operate the two separate lines, existing, smaller pumping units (250 to 300 horsepower each) were rearranged and seven new 1200 horsepower units were added to obtain the greatest pumping capacity possible. Capacity on the 8-inch line is now 36,000 barrels per day while the combination 8- and 12-inch line will pump 47,000 barrels per day giving a total capacity of 83,000 barrels per day in this section. This is 33,000 barrels per day higher than the rate possible before the current expansion.

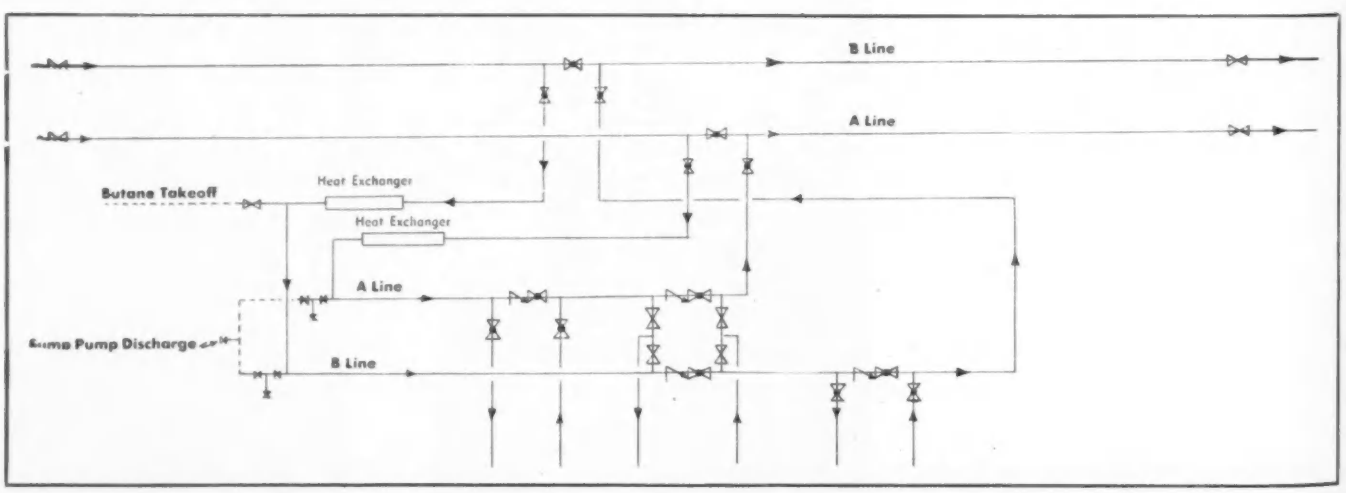
The short section of the system from Paola to Kansas City (53 miles) has an 8-inch and 6-inch line in parallel. Two pump stations are on each line. To each station a 1200 horsepower pumping unit was added, raising capacities to 42,900 barrels per day on the 8-inch line and 17,000 barrels per day on the 6-inch. This is an increase of 21,000 barrels per day for the two lines.

The section from Paola to East St. Louis, distance 264 miles, also is a dual line system. One of these is the original 8-inch line. The second consists of 126 miles of 8-inch pipe which was formerly used as partial loops for the original line and 138 miles of 10-inch pipe which has just been added to complete the second line. Several 300 horsepower pumping units were moved from the Borger-Paola section to this section to provide optimum capacity. The pumping rates now possible are approximately 30,000 barrels per day on the 8-inch and 39,000 barrels per day on the combined 8-inch and 10-inch line for a total of 69,000 barrels per day. This represents an increase of 30,000 barrels per day added by the current expansion.

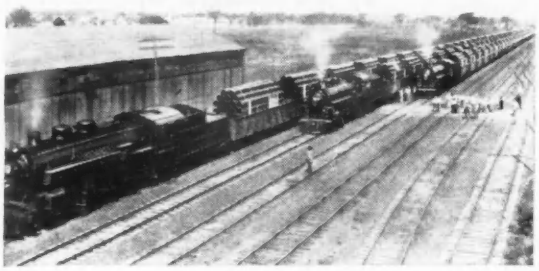
The East St. Louis to East Chicago section, a distance of 269 miles, is an 8-inch line with four partial loops consisting of 198 miles of 8-inch pipe. This section operates with four regular pumping stations and four smaller intermediate booster stations. The capacity of this section will be 41,800 barrels per day which is an increase of 11,800 barrels per day. The expansion involved in this section was the addition of the 198 miles of 8-inch loops.

The expansion program did not include any additions to the Borger-Denver line although this line was enlarged during 1950 by extending the line from La Junta, Colo., to Denver and adding horsepower at Borger, McKee, Texas, and La Junta, Colo. This, plus the addition of an intermediate automatic booster station at Boise City, Okla., provides a present capacity of 11,900 barrels per day between Borger and La Junta and 8500-barrels-per-day for the La Junta-Denver portion. This is a single 6-inch line, 355 miles in length.

Summarizing, the system extends 355 miles from Borger to Denver and 950 miles from Borger to East Chicago with a total of 408 miles of 6-inch pipe, 1579 miles of 8-inch, 138 miles of 10-inch, and 163 miles of 12-inch. There are 32 pumping stations and five booster stations with 24 of the stations pumping on two lines.



Ramsey, Kansas, pump station manifold allows pumps to discharge into either one of two parallel lines.



First shipment—Three of the six trainloads of 22-inch welded steel line pipe ready to leave for the Dixie Gulf Gas Co. pipeline project on September 15, 1927.

A quarter of a century ago, on September 15, 1927, six trainloads—225 cars—of pipe were consigned to the Dixie Gulf Gas Company for their line to run from Waskum to Port Arthur and Houston, Texas, comprising 300 miles of 22-inch and a small mileage of 16-inch pipe.

This is an important date because it marked the start of construction of the first large diameter pipe line made wholly of electrically welded pipe.

Prior to 1927 the entire large diameter line pipe manufacturing capacity of the country was less than three miles per day. With line length and capacity restricted by high cost and limited production, the few existing pipe lines of the day were necessarily of small diameter, serving only the few local markets adjacent to oil and gas fields.

Then in 1927 A. O. Smith introduced welded pipe in diameters larger than had ever been built before. With this new process, A. O. Smith could weld 40-foot lengths of pipe on a mass-production basis. Hundreds of miles of pipe could be made in a matter of weeks instead of years.

Long distance transportation of gas and oil became a practical economic reality, marking the beginning of the nation's vast pipe line system.

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Design of Parallel Centrifugal Pumps In Gathering System Simplified

Line and Pump Curves Plotted to Identical Scale to Save Many Engineering Hours

By RAYMOND B. TROW
Chief Engineer
The Texas Pipe Line Company

PERFORMANCE curves saved hundreds of hours in determining the flow and pump-off time of the 12 centrifugal pump stations on The Texas Pipe Line Company's Terrebonne Bay gathering system. (See August, 1952, WORLD OIL).

Here was the problem. As many as six pump stations had to be tied in to a common pipe line. Each of them injected crude from various tank batteries into the system, and as they finished pumping off, they dropped off the line one at a time. This meant that each of the stations had to be designed to operate individually or in parallel with other stations located at distant points. At times six different stations would be injecting into the line. And again, only one station would be operating on the entire system. In other words, each station had to operate in parallel with other stations with the head varying from 75 to 600 pounds per square inch.

The calculations required to study the performance of the stations ran into almost countless man hours. This led to the development of a simplified system which would give approximate results. The throughput curves of the various sections of pipe line were calculated and plotted on transparent paper. The performance curve of the pump was plotted to like scale. Then these curves were matched together in such a way that the performance of the various combinations of stations could be determined in a few seconds. Although the accuracy was somewhat limited, it was satisfactory for design purposes.

The accompanying illustrations show a simplified version of the method followed in determining station pump-off time and pipe line throughput. Figure 1 shows a small system with centrifugal pumps located at points A, B and C operating in parallel. The problem is to determine the volume of oil each will inject into the pipe line. This in turn will give the total throughput at point D.

The first step is to construct the curves shown in Figure 2. Note that all of the curves are plotted in pounds-per-square-inch pressure versus barrels of oil per hour delivery. These line curves are based on conventional flow formula taking viscosity, gravity, etc. into account. (Only one pump curve is shown, since all pumps in Terrebonne Bay are identical).

At this point an assumption must be made as to the total volume these pumps will put through the line from C to D (Figure 1). After working this problem a few times a fair guess can be made. In this instance, 720 barrels per hour throughput at D will be assumed as shown in Figure 3. From the curve it can be seen that pressure at point C must be about 120 psi for the line to deliver this volume of oil at D.

The next step is shown in Figure 4. Slide the pump curve along the base line until the curve intersects the 720—120 coordinate on the line curve. The curve shows that the pump is injecting 430 barrels per hour into the line while pumping at the 120 psi head.

If the pump at C is developing 430 barrels per hour and the line at C

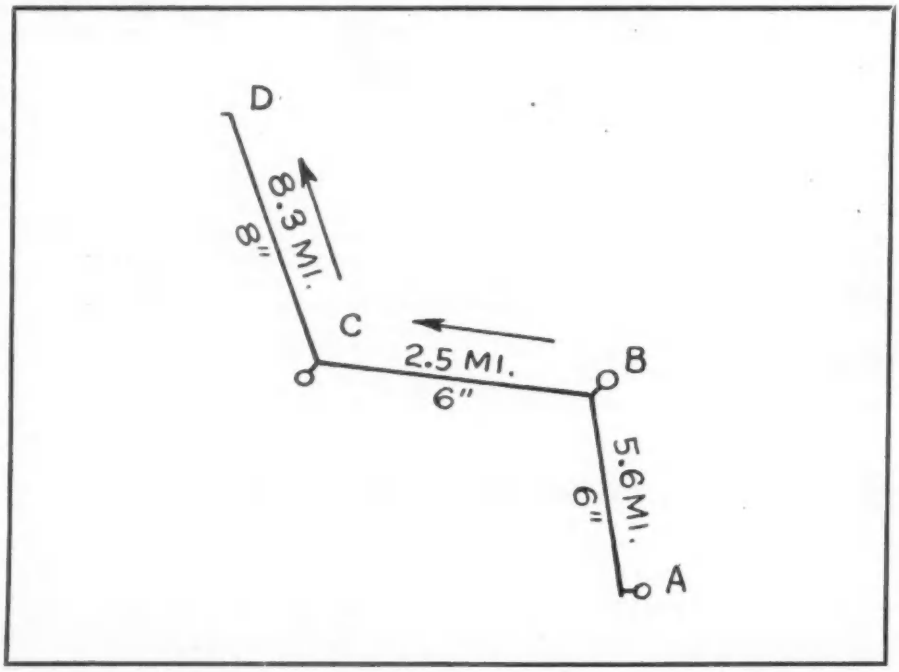

FIGURE 1.

has a total throughput of 720 barrels per hour, the difference of 290 barrels per hour is flowing through the pipe from B to C. Additional pressure will be needed at point B to effect this throughput—enough pressure to overcome the head at C and the friction loss of 290 BPH in the line from B to C. Determine this pressure by placing the curve of the line from B to C on top of the curve of the line from C to D as shown in Figure 5. The total pressure required at point B can be read at the left of the curves as indicated by the dotted line.

Next (Figure 6) slide the pump curve along the base line until it hits the B—C line curve at 290 barrels per hour. This gives pressure the pump at B must develop to inject into the line at B. At this pressure the pump at B will deliver 275 barrels per hour as read from the pump curve. Subtract this from 290 barrels per hour and it leaves only 15 BPH to flow through the line from A to B.

By superimposing the A—B line curve on the other two as shown in Figure 7, the pressure necessary for injection at point A can be read.

But when the pump curve is superimposed on the line curves (Figure 8) it becomes apparent that there is an error in the original assumption. The pump curve shows that the pump at A will deliver 260 BPH into the line if operated at pressure necessary to overcome the line pressure. This proves the original assumption was wrong and that 720 barrels per hour from C to D was in error.

The correct solution is shown in Figure 9. Starting with the assumption that 730 barrels per hour was delivered at D, the pump at C will inject 410 BPH leaving 320 BPH in the line from B to C. The total pressure at B is such that pump B will put up 200 BPH leaving 120 BPH coming from A to B. The last step is to place the pump curve over the A to B line curve. This shows that the pump at A will deliver 120 BPH into the line. This means the assumption of 730 BPH was correct. And when all three of the pumps are operating, pump A will inject 120 BPH into the line, pump B 200 BPH and pump C 410 BPH, making up the total through-put of 730 BPH.

Curve Illustrated

All of the foregoing is purely hypothetical and illustrates the method used in making studies in the centrifugal pump stations. A performance curve of the pump used in all 12 of the stations is shown in Figure 10. This curve was arrived at by first determining the horsepower of each pumping unit by calculating the horsepower requirements for the entire production field and dividing this figure by the number of stations required.

Once the size of each unit was determined, the next step was to obtain a curve as steep as possible so that several such pumps in parallel would never back up on the curve to a point where volumes would be indeterminate or zero. At the same time the curve should fall off fast enough so that at no volume would it demand horsepower over that of the driving

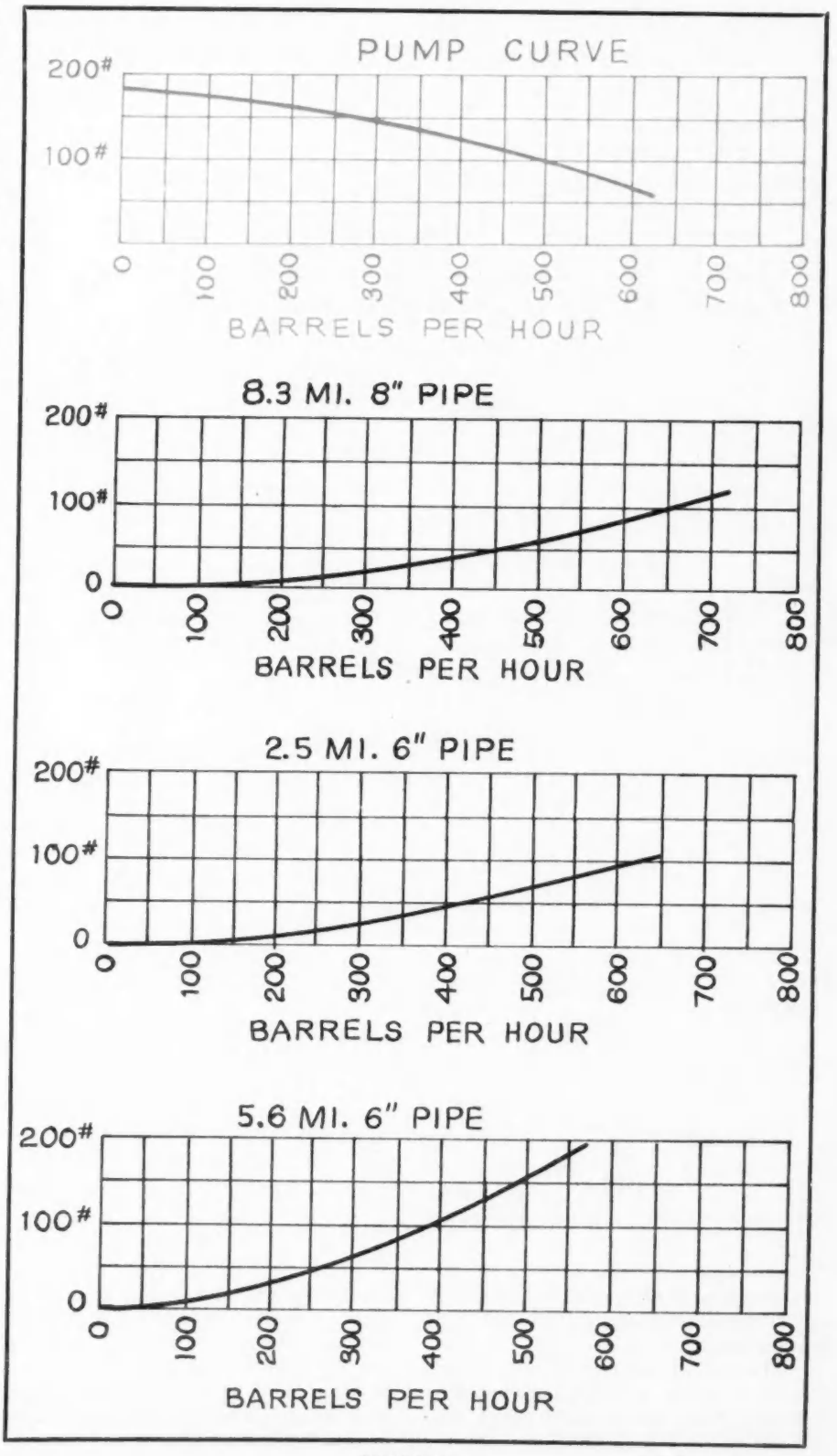

FIGURE 2.

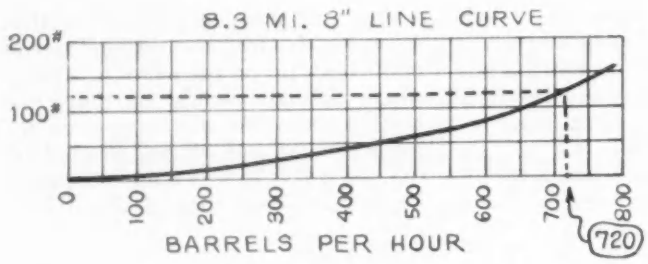

FIGURE 3.

About the Author

RAYMOND B. TROW, a native of Tekoa, Wash., was graduated from Rensselaer Polytechnic Institute, Troy, N. Y., in 1923. He worked for Socony-Vacuum Oil Company, Inc., and the New York state architect's office. After 20 years as a sales engineer, he retired in 1946. He came out of retirement to join The Texas Pipe Line Company in 1947 and advanced to chief engineer. In this capacity he directs engineering on the company's expansion program.

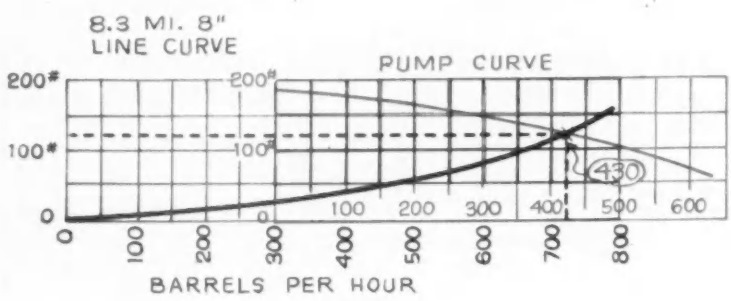

FIGURE 4.

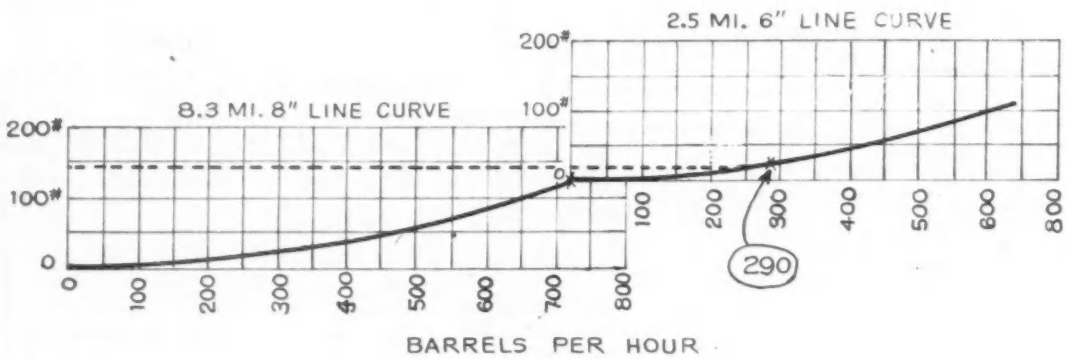

FIGURE 5.

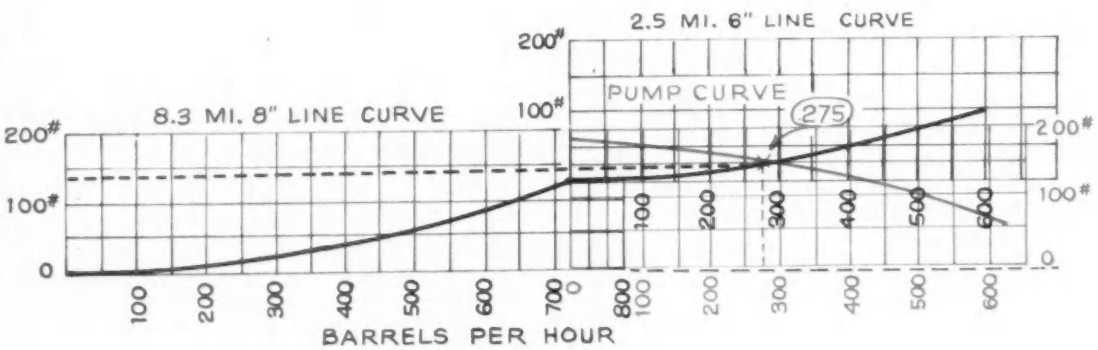

FIGURE 6.

engine. On these specifications the 38 horsepower engines and pumps were purchased.

The size of the engine was limited to 38 horsepower partly because of its weight. Since an ordinary speed boat could easily handle 1000 pounds the weight of all spare parts was limited to this figure. This meant savings in making repairs because the stations are only two hours from land by speedboat—but five hours from land by slow repair boats. This size engine and pump was the largest available in this limited weight.

In order to speed replacement and reduce the stock of spare parts needed for maintenance this identical pump was selected for all stations. To effect future increases, additional pumps of this size can be added connected in series at the individual stations to increase pressure and pipe line capacity.

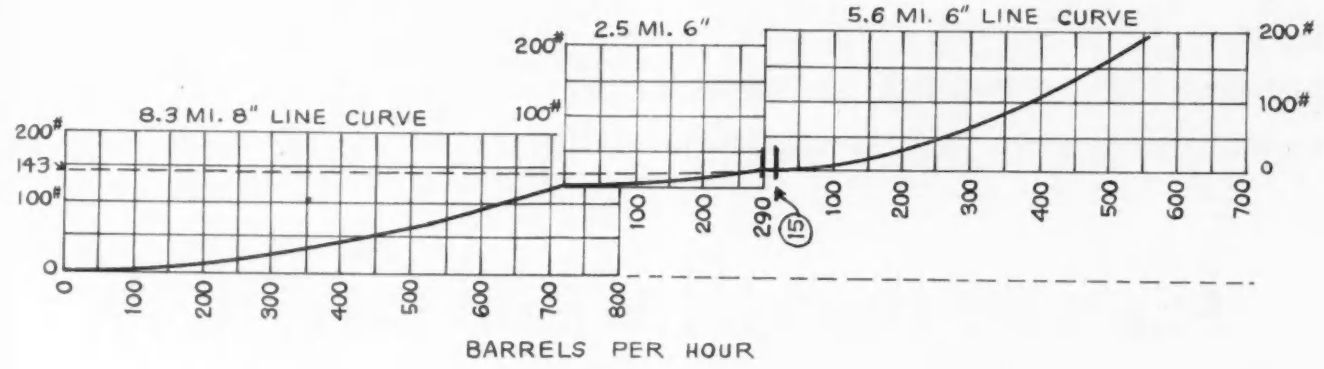

FIGURE 7.

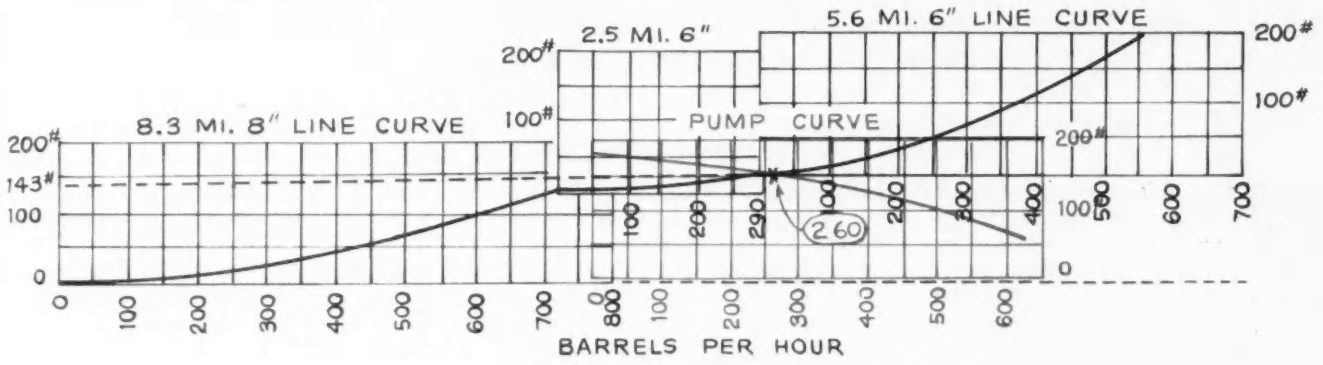

FIGURE 8.

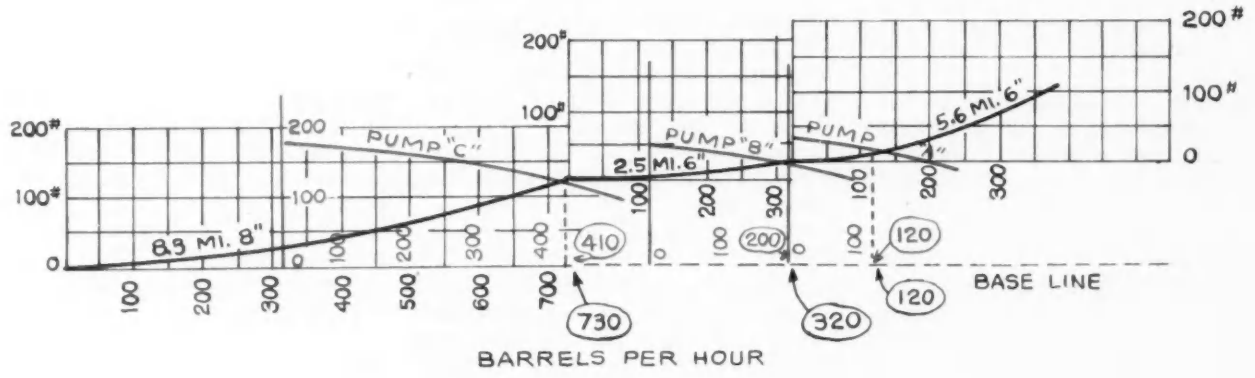

FIGURE 9.

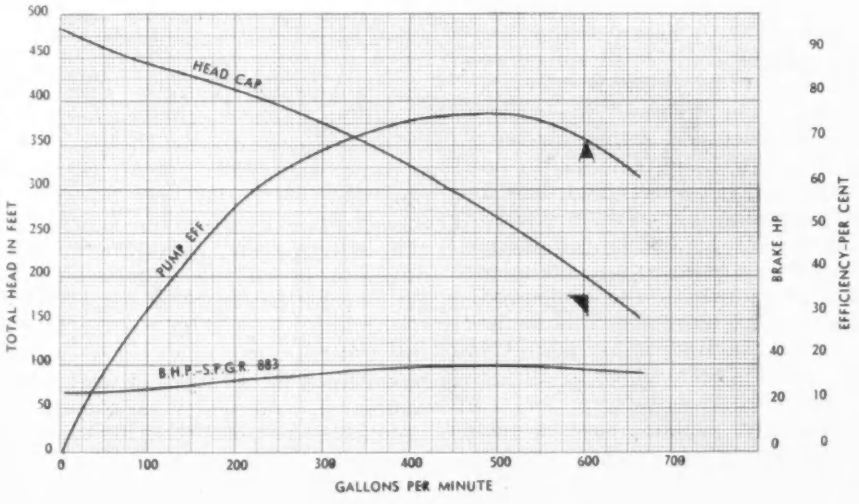

FIGURE 10.

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Contractor Calls for Definition of Responsibilities, No Misunderstandings With Owners–Believes That . . . .

Standard Contract Would Benefit All

By C. CLARK BLEDSOE

Secretary-Treasurer, Midwestern Constructors, Inc., Tulsa

THE problems confronting the pipe line owner and the contractor are old ones. Yet they could be easily and simply solved. They originate in a lack of understanding between owner and contractor as to what is expected of each. Responsibilities are not clearly defined. They are left dangling at the time of job planning. More often than not they are determined after construction has started—or even after construction has been completed!

Incredible as it seems, many a contractor has undertaken a multi-million dollar pipe line construction project not knowing the extent of his final responsibilities.

Such practices are detrimental to the owner, as well as contractor. Since the contractor cannot anticipate his responsibilities he makes a bid which he hopes is high enough to carry him through. To say the least, this practice is not businesslike—on part of either owner or contractor.

Proposed Solution

One solution that has been proposed is adoption of proper standardized construction contracts and specifications, which would define the responsibilities of contractor and owner. They would be determined by foresight rather than hindsight. Both owner and contractor would be better off. This would allow the contractor to make a sensible, balanced bid on the project with some certainty that he will at least survive the job. The bid would benefit the owner also.

Specifications should in all instances set forth reasonable estimates of units of work and the exact price to be paid per unit on all anticipated work. They should include unit prices for welding, painting, rock, tile, casing, gate valves, etc. They should spell out the exact dimensions of pipe to be furnished by owner, and the unit prices should be listed according to pipe dimensions. Unit prices for welds should be based on different pipe dimensions.

Representatives of American Petroleum Institute, American Gas Association and Pipe Line Contractors Association have recently made progress in attempting to standardize specifications for welding. Through cooperation of owner and contractors, progress can be made toward standardizing specifications for other operations of the job. Both owner and contractor will benefit from such standardization.

Too often during the undertaking of a large project, it is necessary for the owner to employ inexperienced personnel for inspection purposes! Too often, in such instances, there is a lack of a positive plan; owner's representatives are uncertain as to what is wanted by owner. They must check and recheck. Even then, at times, are not sure. This causes unnecessary delay, expense and confusion. More complete specifications would tend to provide a positive plan that could be followed by owner's representatives and contractor without doubt or hesitation. This could be enhanced if owners gave their inspectors responsibility and authority.

Differences of opinion sometimes arise between representatives of owner and contractor as to the responsibilities of each. A more workable method of settling such disputes should be adopted and incorporated in all such specifications.

Frequently, methods used to settle disputes, constitute empty gestures. They are not indicative of a sincere effort to settle bona fide disputes or controversies. A sincere effort should be made by both owner and contractor to establish satisfactory methods of settling disputes by means of arbitration. If possible, the matter should be settled immediately. Yet in present day practice the contractor is put in a position of shutting down the work, in the event that a dispute has arisen. And if he is in error, he is liable for costs. More often the contractor completes the work which he knows is in controversy, all the while hoping that the controversy will be ultimately settled in his favor. Under such circumstances, he, and his very survival are at the mercy of the owner, unless he seeks legal recourse in the courts. The latter is a very expensive procedure.

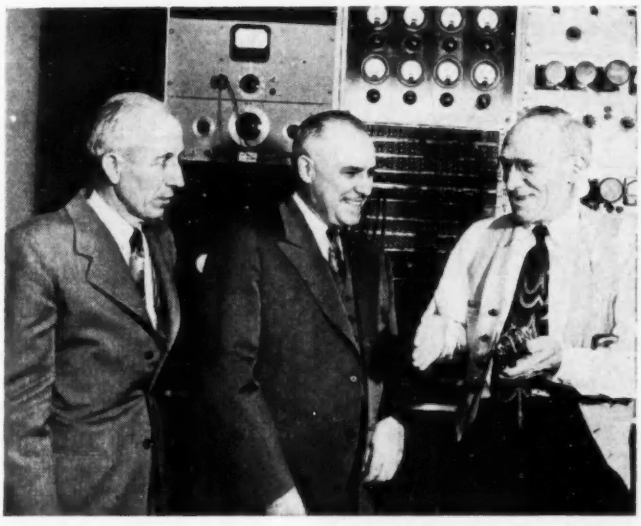
Arbitration Can Help

Through the use of proper methods of arbitration, contractor and owner may at all times know their responsibilities and can chart their course accordingly.

Owners can eliminate many of the difficulties encountered, by supplying experienced and capable inspectors, who are solely interested in seeing that contractor performs his work according to the specifications.

In the final analysis, the problems of owner and contractor arising from pipe line construction can be largely solved simply by the determination of responsibilities of contractor and owner prior to the undertaking of actual construction. Such responsibilities should be set forth specifically in the specifications, unit prices should be set forth for all types of work contemplated, and where practicable standardized clauses covering types of work and unit prices to be paid

■ CONTINUED ON PAGE 269



LEFT. Left to right are Dwight L. Fawcett, lineman, Leo L. Friedley, telephone and telegraph supervisor, and Fred A. Wilson, lineman, in Service Pipe Line Company's telephone and telegraph repair and maintenance headquarters in Tulsa.

RIGHT. Ernest A. Price, wire chief, explains a point to Glenn J. Frisinger, left, assistant wire chief, and John O. Holder, assistant superintendent of telephone and telegraph. All are from Tulsa office.

Get More Use From Wire Line Facilities

Revamped Telegraph Lines and Poles Now Being Used To Telemeter Pressure, Operate Remote Control Valves

By H. L. WHEELER

Communications Engineer, Service Pipe Line Company, Tulsa

AFTER a little revamping a 30-year-old telegraph system now operates six control valves from 60 to 108 miles distance and telemeters 13 different pressure readings. This is typical of the new uses pipeliners are finding for wire lines and poles.

Other companies are using the teletype to supplant or work with telegraph and telephone systems. The circuit can be derived from the simplex or Morse leg and can be used at any point where power is available.

If for any reason a telegraph circuit is not used for written communication, the simplex leg can be used for other purposes. For instance, an unattended gathering system served by a telephone network may utilize the Morse leg as a shutdown indicator by using a coded alarm mechanism. The dispatcher at a central point may readily observe which station is down and at what time failure occurred. Also, in case of a pipe line break, he may start or stop a station at will by using polarized battery through copper oxide or similar dry disc rectifiers. This type of service is being used on one spur of the Service Pipe Line Company system.

Although the physical telephone circuit can be used successfully without repeaters for a limited distance it is still a flexible means of pipe line communications. In case of trouble the line can be split, and the good sections may be utilized each way from the trouble. In case of a short or in case one side of the line is open, telegraph or teletype communication may still be satisfactory. A spur or branch line can be quickly hooked in at any point, or a pipe line repair crew can usually, by means of a jointed line pole, connect its portable telephone at the location of a pipe line break and be in constant contact with headquarters.

When a physical circuit is to be used for any great distance, voice repeaters are necessary to maintain satisfactory transmission. In oil field and pipe line systems having frequent way stations and spur lines, many impedance irregularities are encountered, therefore, it is usually necessary to operate a repeater at a relatively low gain in order to insure stable operation. Where these conditions exist, most companies use other facilities for long-haul communications and permit the physical to be used for point-to-point communications.

Where many pump stations are connected on one telephone circuit, there are advantages in being able to call individual stations. Code rings are unsatisfactory. Where employes are required to stop work to listen for a code ring they frequently ignore all rings. The answer lies with selectors which give a continuous ring with an answer-back signal; that is, calling party receives a tone or code to know the called party is receiving a signal. There are several types avail-

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Edward F. Meyer, oil dispatcher, in Tulsa office.

Elsie L. Blackstock, Tulsa office message clerk, at work.

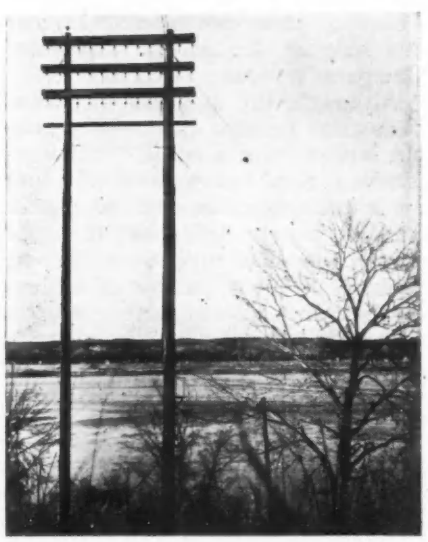
able: One responds to 20 cycles and using a long and short ring combination to actuate a selector. Its primary advantage is that linemen or repair crews anywhere along the line may bridge on and select the desired person or place. A second type is the tuned frequency type—usually a vibrating reed which operates at only the desired frequency.

In some instances where a physical line has many way stations along its route, a satisfactory level of transmission may be realized, yet ringing is difficult or impossible because all ringers must remain across the line in order to be signalled. A very sensitive relay may be employed to operate a howler or other signaling device. Service Pipe Line Company has developed a sensitive vacuum tube relay to receive 20-cycle ringing signals which are too attenuated to actuate the conventional ringer. These relays have given highly satisfactory service over a period of several years. The high impedance characteristics of the units permits as many units as desired to be bridged across a telephone line without materially affecting impedance regularity. Therefore, the utility of a heavily bridged physical telephone line may be greatly extended by the use of these relays.

During the last few years the requirements for additional circuits for communications have shown a phenomenal growth. This is true both for companies supplying public communications and for companies requiring circuits for the efficient operation of their own business. The latter category includes pipe lines, railroads, utilities, etc. In fact, the growth of transportation, regardless of its nature, nearly always demands a growth in communications facilities.

In order to derive additional facilities from an existing pair of wires, whether they are open wire or cable, the use of carrier telephone has become well known and widely used throughout the privately owned communication field. These circuits operate above the usual voice frequency range or above 4 KC. They are not heard at intermediate points; therefore, the circuits are entirely free from eavesdropping between terminals, making it possible to have private telephone service between headquarters and division offices.

Most present day carrier systems



Service Pipe Line Company's communications system crosses Arkansas River near Sand Springs, Okla.

are extremely flexible. A wide choice of multi-channel carrier telephone systems is available from various manufacturers which are time tested package units requiring only a few days to place in service. These present day systems suffer very little from obsolescence. Carrier systems may be obtained as single channel or multiple channel systems. Certain single channel systems are so arranged that additional channels may be added on a unit basis as traffic density demands. The carrier terminals of this system may be terminated or dropped off at any point desired to meet ever changing operating conditions. Also, by the aid of amplifiers or repeaters at required intervals, carrier circuits may be made to operate between most any points in the system with very little or no transmission loss. However, long haul carrier systems should be equipped with automatic regulation if maximum performance is desired, especially if teletype or facsimile is to be used. Most of these systems (usually three-channels) operate in the frequency spectrum between 5 and 30 kilocycles. In general, the frequency assignments on which these operate have been selected to permit coordination between various types. The recognized frequency assignment involves the space from approximately 6 to 17 KC from east to west, and 17 to 32 KC west to east.

In many cases due to rapid development of a specific area, additional communications facilities are required. With all available pairs already equipped with three-channel carrier systems, the situation either

demands that more lines be constructed or that carrier systems working at frequencies above 30 KC be employed. Fortunately it is not usually necessary to construct additional lines or retranspose in order to obtain a few extra channels in the spectrum above 30 KC. The most important factor to be considered is that the higher frequencies suffer greater attenuation and impedance mismatches that might be ignored up to 30 KC, may cause significant peaks and dips in the line attenuation curve at higher frequencies. Usually these problems may be minimized by the judicious use of junction filters and cable matching transformers.

Many different types of high frequency carrier systems are available from various manufacturers ranging from 3 to 12 channels—making it possible to obtain a maximum of sixteen channels of voice communications (including the physical) and as many as 46 telegraph or teletype circuits from one existing pair of wires. Or another standard three-channel 6 to 30 KC system may be group modulated (or translated) and stacked above the present system. In the following manner—the three east to west low frequency channels are hetrodyned at 30 KG, thus shifting the normal 6 to 17 KC east to west transmission to the 36 to 47 KC band while the high frequencies are raised 35 KC, shifting the normal 17 to 30 KC west to east transmission channels to the 52 to 65 KC band.

Both telephone and carrier circuits provide all the tools necessary for facsimile, telemetering or supervisory control of pipe line stations and systems to almost any desired degree. Such controls used on closed crude batching systems along with electric motor operation and electrically operated valves may become a major factor in modern pipe lining, through savings realized with improved system operation, simplification of operators' duties and quicker adjustment for a change in conditions.

In order to realize maximum usage of a carrier system, as many as three telegraph or teleprinter circuits may be taken from any or all carrier channels without seriously impairing intelligibility. Adequate and efficient communication service is as essential for successful pipelining as it good pumping equipment, good working conditions and good personnel. It depends not only upon good initial construction and equipment but upon also the adequate maintenance of these facilities to the highest practical standard.

ACKNOWLEDGMENT

This article from a paper presented before PIEA, Tulsa, April 14-17, 1952.

Standard Contract

■ CONTINUED FROM PAGE 262

therefor, should be adopted by owners and contractors. Speedy and just arbitration should be available for the settlement of disputes not anticipated by the contract or specifications. By employing these methods, both owner and contractor could and would know to a large degree, the responsibility to be assumed by each party during the contemplated project.

Another thorn in the contractor's side is the difference between the inspector's more or less modest pay and the skilled construction workmen and foremen's pay. Actually the contractor's forces receive higher pay because the work is highly specialized, because the end of every job usually means unemployment and expensive travel.

Pay a Factor

Inspectors are prone to forget this. And sometimes the jealousy originating in this difference in pay causes otherwise capable inspectors to lose sight of their own company's interest in an effort to give the contractor's highly paid men "a rough time." Here's an example that has occurred many times—with variations: When it is necessary for the contractor to work late—even into the night—to finish a tough job, the inspector stalks off the job, warning that if work is continued it will have to be torn out for his inspection in the morning. Now, often this particular creek crossing could cost the contractor heavily in case rain came before it was completed. It could also delay line completion and adversely affect the owner. If repeated it could cause individual workmen to attempt to "put something over" the inspector. Trouble of this sort could be minimized if owners paid employes more money for inspection work.

The following are a few simple suggestions which have proved helpful on various jobs: First, arrange for a pre-job conference between inspectors and foremen. Completely review the specifications and contracts in order that both parties may become familiar with all requirements, and each inspector can get acquainted with the foreman who is in charge of the operation to be inspected.

Impress on owner's employes that the contractor is definitely an independent company and not an agent for the owner.

Owner's employes should not supervise contractor's employes, nor give orders or instructions to workmen.

Inspector should notify foreman or superintendent immediately of any breach of the specifications, not waiting until crews are a mile or so down the right-of-way.

Have inspectors give credit to foremen and workmen for good safety record, and the owner give publicity for this safety record to the contractor and the superintendent.

When a job is getting underway, inspectors would be wise to turn their heads to small imperfections for the first few days. It would help tremendously because the foremen are having trouble getting their men lined out for their respective duties. Also, the men are not familiar with their particular place in the functions of the crew. At this crucial time the crews are like a baseball team in a world series game—they are jittery. After the crews have calmed down and started functioning, then is the time to correct their work or alter their methods. The strangeness and newness of the job will have worn off and working will have become acquainted.

About the Author

C. CLARK BLEDSOE has been very active in the Pipe Line Contractors Association of which he is treasurer and has given considerable study to the problems connected with the construction of pipe lines. He attended Westminster College, Fulton, Mo., and Oklahoma A. & M. College at Stillwater, Okla., where he received his B.S. degree in industrial engineering. He went to Tulsa in 1934 and has since engaged in a successful business career as well as participating actively in civic affairs. His business affiliations include the positions of secretary-treasurer for Midwestern Constructors, Inc., Tulsa, and he is vice-president of Associated Natural Gas Company, Sikeston, Mo., and Comstock Midwestern, Ltd., Toronto.

Gas Alarm System Simple and Reliable

New Instrument Overcomes Necessity of Constant Adjustment, Shows High Resistance to Poisoning

AN ALARM system that warns of explosive concentrations of vapor and air or natural gas and air is setting records for dependability and efficiency. It requires little or no adjustment over long periods of operation. The zero drift of the new alarm is less than 2 percent of the range in three months operation. This instrument is a step forward in protecting pump stations and compressor stations against the greatest hazard—explosion.

In the past difficulty has been experienced with alarm systems. The constant need for adjustment made them unreliable. For example they were easily "poisoned" by leaded gasolines and gave inaccurate readings. Also, they required frequent attention and adjustment to insure accuracy. Consequently their use in the industry has not been widespread.

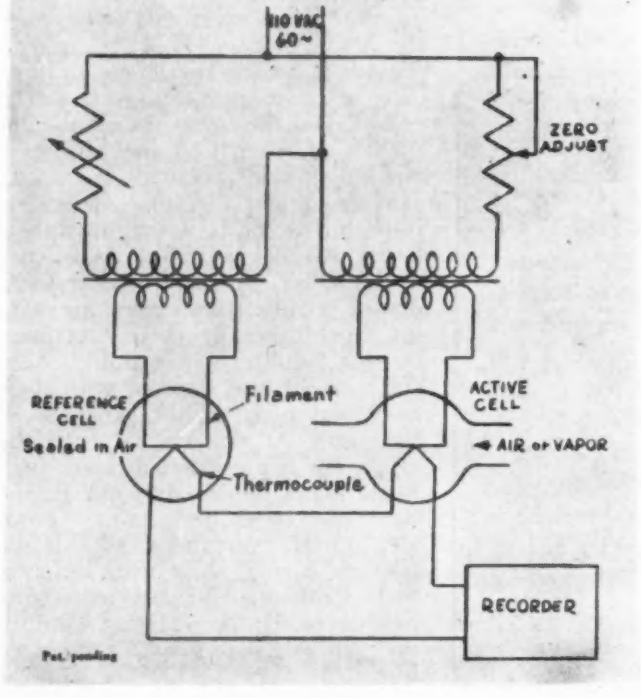
But two years' operation on a products line proves the new instruments do not require frequent calibration. And they show high resistance to poisoning.

The operating principle of the instrument is simple. A current is impressed on a catalytic filament, heating it to a certain temperature. This filament is in an open-ended tube. A suction pump draws samples of air and vapor through the tube across the filament. Flamable hydrocarbons coming in contact with the hot filament burn. This causes a rise in temperature. This rise in temperature is measured by a thermocouple bonded to the filament.

Fortunately, the temperature of the catalytic filament will remain constant even though its cross-sectional area is reduced by evaporation. The explanation lies in the fact that as the area decreases, the resistance increases. This reduces current flow and the temperature remains more or less constant.

As shown in Figure 1, a second element measures temperature of a filament in a tube filled with static air. This reference tube has a like current impressed on the filament. A thermocouple bonded to this filament is connected in series with and opposing the thermocouple in the sampling tube. Their differential output is measured and recorded on a centrally located instrument. This recorder or meter is calibrated in terms of percent of lower explosive limit of the gas or vapor-air mixture.

Figure 1 shows a schematic circuit of the continuous vapor analyser. A



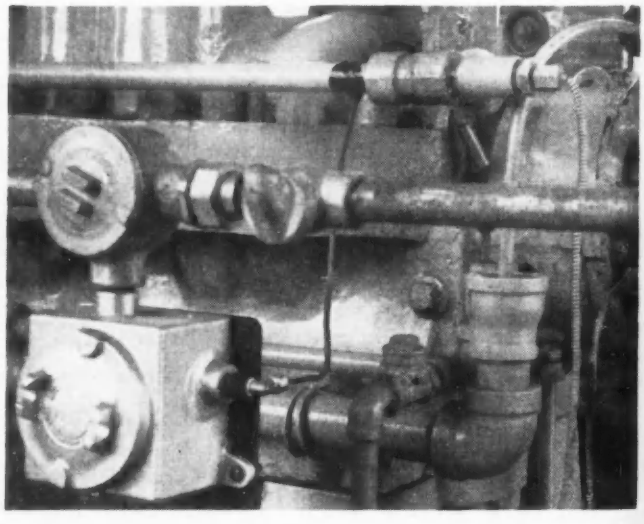


FIGURE 1 (left). Schematic diagram of circuit of continuous vapor analyser.

FIGURE 2 (above). One of heads mounted in explosion-proof conduit with short sampling tube extending to actual liquid seal.

small rotary vane pump is required to draw continuous samples through the active tube at the right.

Figure 3 shows how the alarm system fits into one of the new teletype controlled electrical pump stations. Note that the combustible gas analyzer vacuum pump draws samples through heads located at the liquid seals at both ends of the pump.

Figure 2 shows one of the heads mounted in explosion-proof conduit with short sampling tube extending to the actual liquid seal.

Figures 4 and 5 show, respectively, the front and rear views of the indicators mounted on the panel board in the control room of a products pump station.

Back of this panel is the rotary vane pump which draws sample into the "head" at the pump.

This instrument shown is the "remote head" type of installation. The sample is taken in or immediately adjacent to the area under test. The electric impulse of changed conditions is transmitted to the control cabinet mounted in the control room.

Under normal conditions all the relays, with the exception of the audible signal relay, are energized. Thus, power failure shuts down pumping equipment.

Two switches are shown on subpanel. One actuates the analysing circuit, the other the current to the pump.

When power is on, "power" light will be illuminated and show on face of panel. If a leak develops at the liquid seal of the pump, the presence of the vapors will be indicated on meter, also showing through panel.

When the concentration of gas is reached, at which the alarm point has been selected and set, the appliance relay drops out, shutting down station, and audible signal relay is energized sounding siren. "Alarm" lights are energized and show on face of panel.

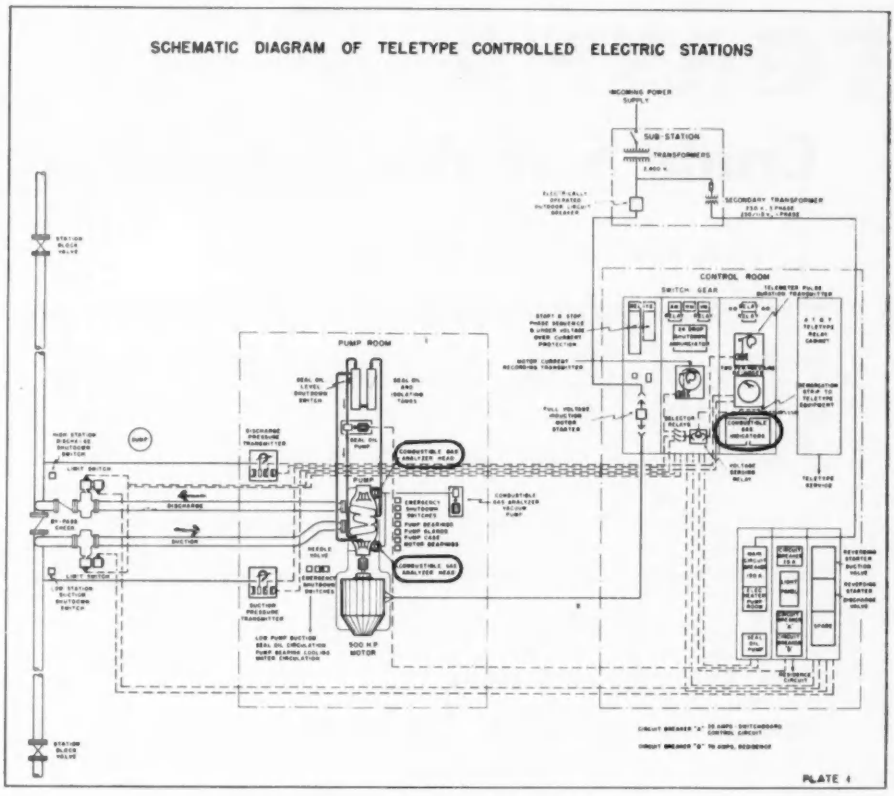


FIGURE 3.

The installation is almost foolproof in that—

- If a filament burns out, the filament burn-out relay will open and, through the amplifier circuit, the appliance relay drops out, the "audible signal relay" is energized sounding siren. Signal lamps are illuminated. The station is shut down as on high gas.
- The siren may be silenced by opening the door and depressing button marked "horn" on sub panel. The unit cannot be returned to operation until filament trouble is cleared.
- Should the flow of sample over analysing filament increase or decrease beyond units set, the circuit, through the amplifier, will open, which will light the "flow" lamp showing through panel and cause appliance relay to drop out, shutting down station.
- In case of thermocouple burnout, which is possible, but not likely, the filament thermocouple burnout feature of the amplifier will operate same as for high gas.

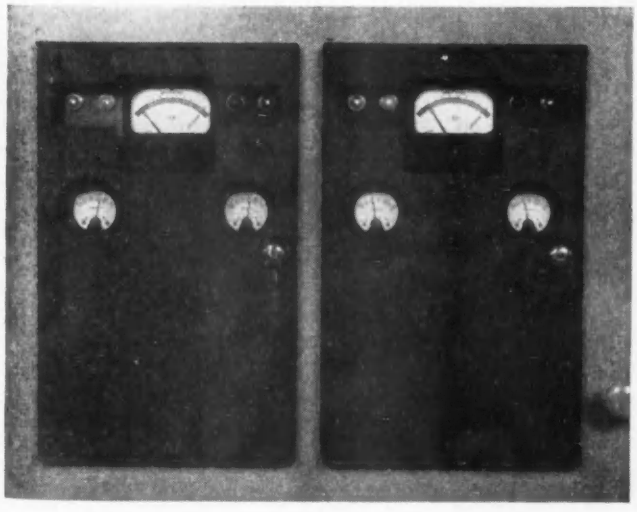


FIGURE 4. Front view of indicators mounted on panel board.

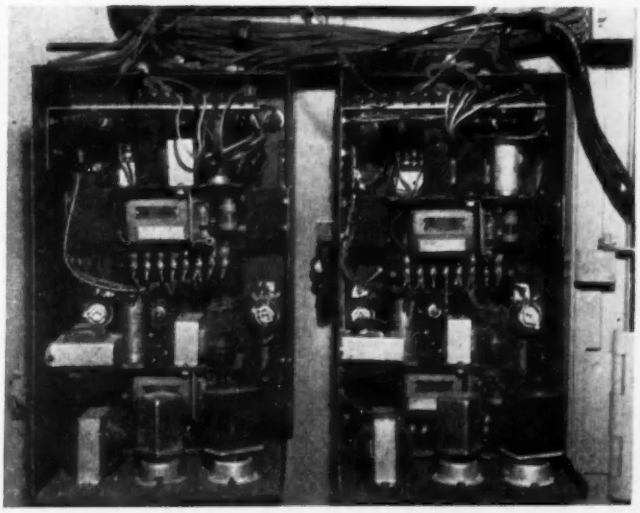


FIGURE 5. Rear view of indicators mounted on panel board.

Crude Sampler Portable and Automatic

New Device Measures Viscosity, Gravity and Indicates Amount Of Interfacial Commingling as Oil Flows Through Pipe Line

By W. E. ROADS
Service Pipe Line Company, Tulsa

A PORTABLE, automatic crude oil sampler has been developed to test gravity and viscosity of crudes as they flow down the pipe line. The sampler is giving good results in obtaining data on common stream crudes throughout the Service Pipe Line Company system. It is being used to determine effects of interfacial commingling of batches of different type crudes.

Most large common-carrier crude-oil pipe line companies handle a number of different grades of crude. Production from each lease must be classified as to grade. All production of the same grade should be handled in the pipe line system as a common-stream crude oil. In other words, it is not necessary to keep individual lease productions separate. Only the common-stream grades need be separated. For this reason, the characteristics of a particular common-stream crude will change somewhat as additional crude is added as it progresses toward refineries. Weathering in tankage and contamination caused by the interfacial commingling of adjacent batches also cause slight changes in the properties of a given grade of common-stream crude.

The gravity and viscosity of each grade of crude oil transported through a pipe line must be accurately determined before the throughput can be correctly predicted. This led to development of the sampler.

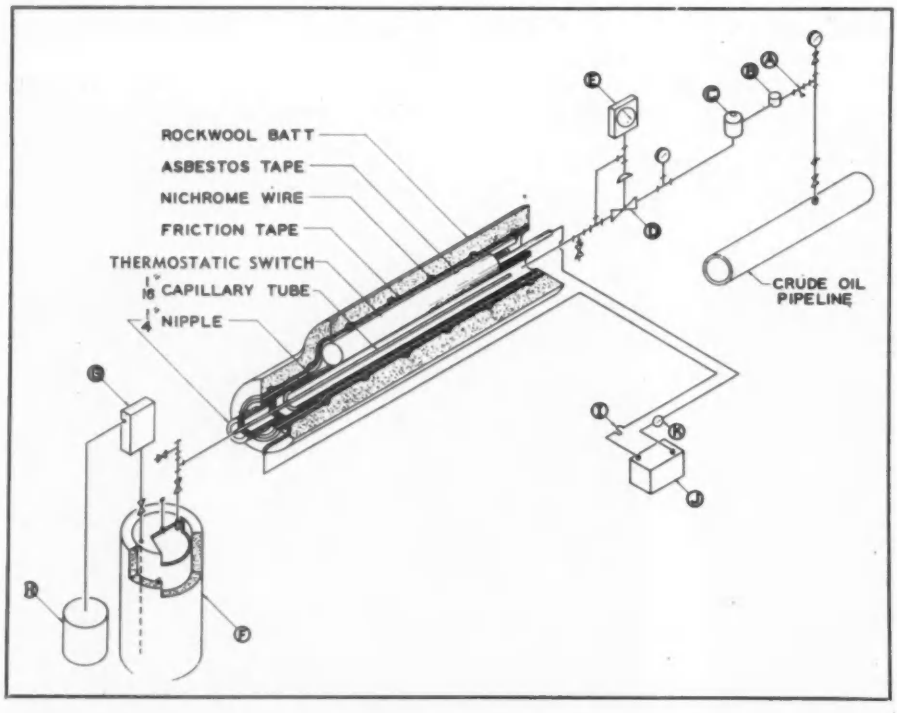


FIGURE 1. Automatic sampler. Key to symbols: A—Y-type strainer. B—pressure reducing valve. C—oil filter. D—diaphragm control valve. E—pressure recorder. F—insulated ten-gallon sample container. G—water reservoir. H—over-flow container. I—fuse. J—six-volt battery. K—DC ammeter.

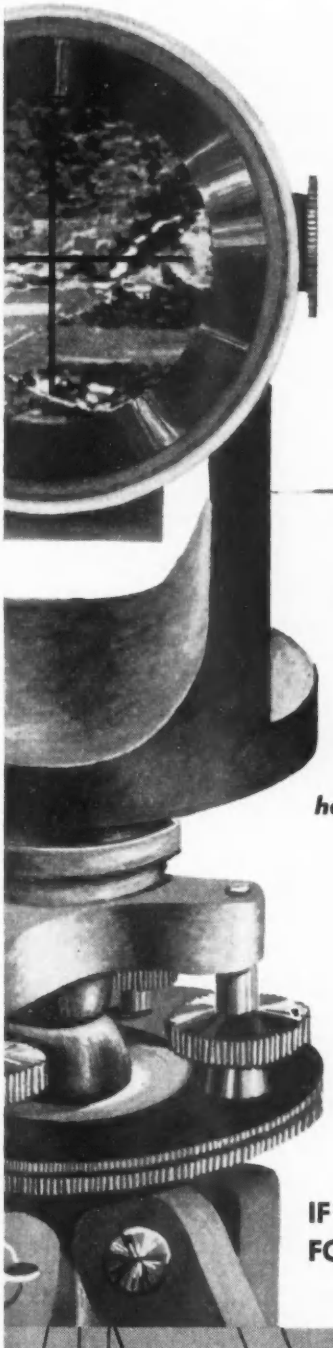
Governing Factors

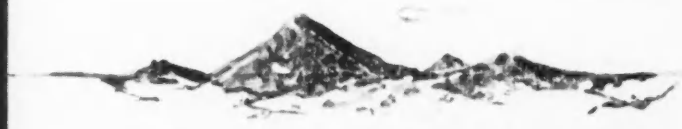
Here are some of the factors that governed the development of the sampler:

1. Samples would be taken at small field gathering stations, at junctions where field lines inject into main trunk lines and at trunk line stations. Many of these locations would have neither electricity nor compressed air. Thus, the sampler must be completely self-contained, requiring no connection to an external power source.
2. A constant-rate type sampler was considered to be satisfactory. Most samples would be taken at locations where the rate of flow through the pipe line is essentially constant.
3. The sampler would be moved from

WHAT LIES AHEAD?

You can read this sentence both ways . . . and you'll only further emphasize the idea we're trying to convey . . . That you can't stay on the ground, no matter what type of instruments you use, and know for certain *what* lies ahead, or what *lies* ahead! The horizon will stump you, impenetrable forests will puzzle you . . . You'll never know until you get there. But, there *is* an easier way!





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Tobin Photographic Maps are actual photographs, shot from a standard height of 13,000 feet. Right in your own office, you can actually fly above your contemplated route, see the complete surface of the land below, detect every obstacle BEFORE it becomes a problem, and figure out how to go around or surmount it. Tobin already has, in its elaborate files, more than 500,000 square miles of the United States, photographed, and correctly correlated, with the ownership map overlays that go with them. Use Tobin service and you'll save time, trouble and money, for in addition to all its normal advantages, the Tobin method preserves the secrecy of your operations until you're ready to sign the leases.

IF YOU'RE EVEN CONSIDERING A PROSPECTIVE ROUTE FOR A PIPELINE OR A PATH, PHONE, WIRE, OR WRITE:

EDGAR TOBIN AERIAL SURVEYS

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one location to another; therefore it must be portable and easily installed.

4. The nature of gathering and batching operations was such that sampling periods of from one week to one month would be required if representative samples were to be obtained. Ten-gallon sample containers had been agreed upon; therefore sample rates as low as 1 cubic centimeter per minute would be required.

5. Samples would be taken from pipe lines operating at various pressures —as low as 10 pounds per square inch in some cases and as high as 1000 psi in others.

6. Basic sediment and water determinations were not required; therefore the water displacement method of sampling would be satisfactory.

Put Into Service

The development of a sampler to satisfy the above conditions was begun in January 1950. By April of that year it was sufficiently perfected to be put in service. Figure 1 shows the original sampler in its final form. Its operation is as follows: crude oil flows from the pipe line through a ¾-inch Y-type strainer (A) containing a 400-mesh element. This strainer serves to filter most of the bs&w from the crude before it passes through the ¼-inch liquid pressure reducing valve (B) where the pressure is reduced to approximately 50 psi. The crude then moves through an automobile-type filter (C) containing a paper element which removes all but the very finest particles of bs. Clean crude from the filter flows to the ¼-inch diaphragm control valve (D) where its pressure is further reduced to approximately 10 psi.

Next, the oil moves through the capillary-tube assembly. This assembly consists of a ten-inch length of 1/16-inch outside diameter by 0.010" inside diameter stainless steel capillary tube brazed into a ¼-inch by 1½-inch pipe nipple which in turn is coupled to a ¼-inch by 12-inch pipe nipple. The 12-inch nipple is wrapped with a layer of friction tape and an 18-inch length of No. 22 nichrome wire. The wire is connected through a thermostatic switch to a six-volt storage battery. Over the nichrome wire is a ⅛-inch layer of asbestos tape and a 4-inch layer of rock wool. The thermostatic switch is adjusted to maintain, within the capillary-tube assembly, whichever of the following temperatures is the higher:

a. The lowest temperature at which all paraffin in the crude will remain in solution.

b. The maximum temperature that the sampler piping is likely to reach during the warmest part of the day.

The crude flows next into the sample container F. As oil enters this container, water is forced into the water reservoir G, the overflow being accumulated in container H. The water reservoir provides a constant back pressure on the system and prevents air from being drawn into the sample container due to rapid cooling of its contents. Accumulated gases and vapors are bled from the top of the sample container approximately once every two days.

Operating Principle

The flow rate through the capillary tube will be constant as long as the dimensions of the capillary tube, the pressure drop across the tube, and the viscosity and gravity of the crude flowing through the tube remain constant. This is the principle on which the sampler operates. Maintaining a constant temperature within the capillary tube holds its dimensions constant and keeps the viscosity and gravity of the crude flowing through the tube essentially constant, provided these two characteristics of the crude flowing through the pipe line do not vary appreciably. Maintaining a constant controlled pressure on one side of the capillary tube and atmospheric pressure on the other side provides a constant pressure drop across the tube.

When the sample container is sufficiently strong to withstand the full line pressure, an advantageous modification of the sampler piping arrangement can be made. This consists of removing the sample container from the location shown in the drawing and inserting it (less the water reservoir) between the sample connection on the pipe line and the Y-type strainer (A). With this modification, only water flows through the strainer, pressure reducing valve, filter, diaphragm control valve, and capillary tube, thereby eliminating: (a) the need for filtering the crude oil, (b) variations in sample rate caused by changes in crude viscosity, and (c) the possibility of paraffin accumulation in the capillary tube. Since the sample is kept at line pressure, light ends in the crude are not vaporized.

Advantages Listed

In applications where bs&w determinations are not required, this special purpose, automatic pipe line sampler offers the following advantages:

1. It is portable, easily fabricated, and easily installed.

2. It is completely self-contained, requiring no external connections to a source of power. This permits sampling at any location where crude oil is flowing under pressure through a pipe line.

3. It is adaptable to taking very small samples over comparatively long periods of time, operating satisfactorily at sample rates as low as 1 cc per minute.

Ten of these units have been fabricated and put in service. Low-pressure installations were made with the modified piping arrangement described above. Because of the low working pressure of the sample containers, high pressure installations were made as shown in Figure 1. In some instances, the containers were buried in order to keep them at a constant temperature. This prevents expansion and contraction of the liquid within the container and eliminates the need for the water reservoir. To date these samplers have taken some 75 ten-gallon samples. Although the samplers require periodic checking (approximately once every 48 hours), they serve their purpose quite satisfactorily, operating well within 10 per cent of their set rate.

About the Author

W. E. ROADS was born in Chanute, Kansas, and received his B. S. degree in mechanical engineering from the University of Kansas at Lawrence. Following three years of military service, he became associated with Stanolind Pipe Line Company (now Service Pipe Line Company) in 1945.

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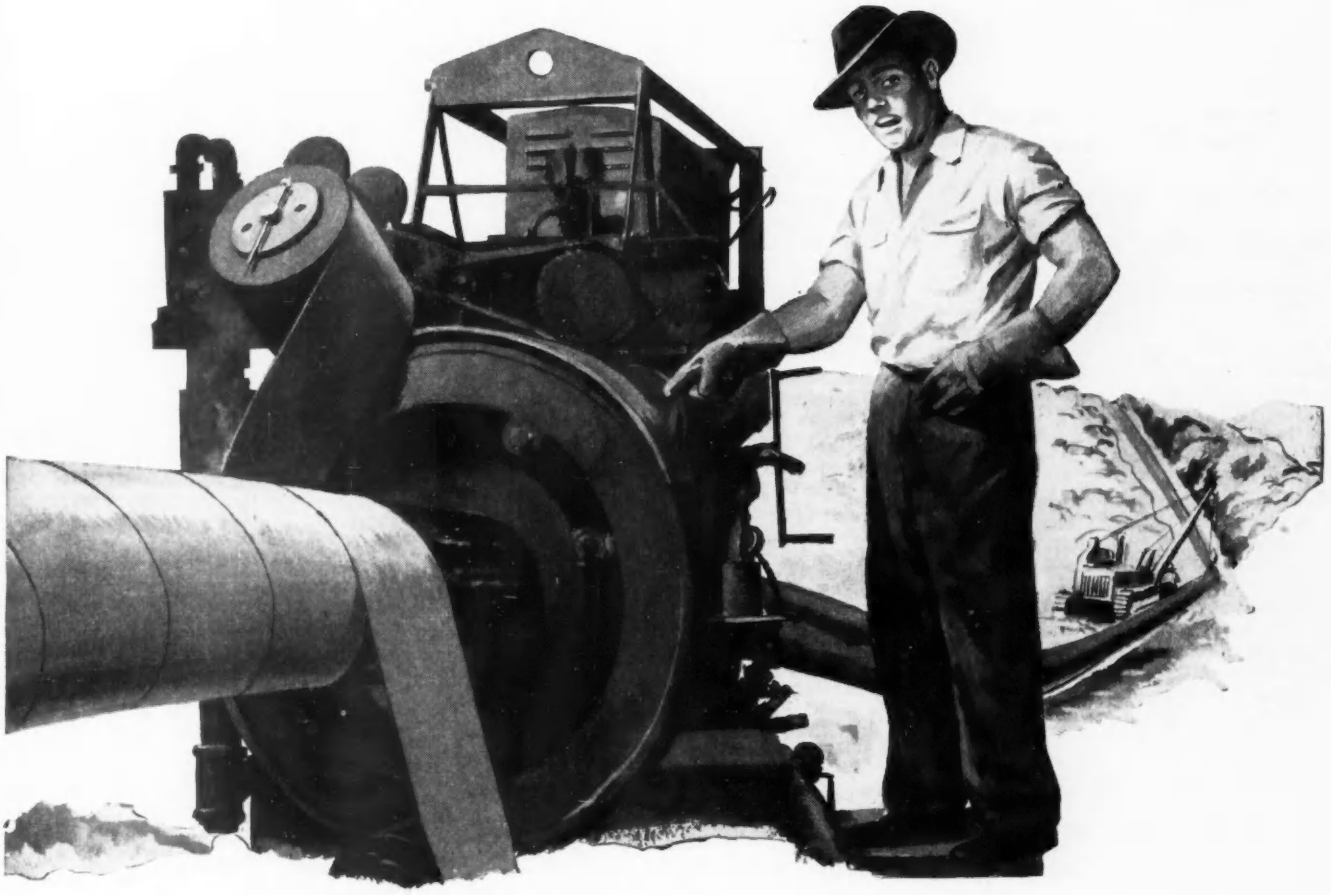

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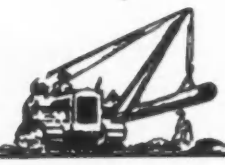
PIPE LINE *Construction*



By ALICE L. GIVEN
WORLD OIL Staff

Projects Announced and Contracts Awarded

Crude Lines

California-Oregon Pipeline Company has started survey work on a 103 mile six-inch common carrier line between Crescent City, Calif., and Medford, Ore. When completed this 7000-barrel-capacity line will replace truck transport.

Humble Pipe Line Company plans 1953 construction of a 14-inch line to stretch from Hawkins to Longview, Texas, where the line changes to 18-inch diameter and runs to the Texas-Louisiana state line.

Phillips Pipe Line Company has announced plans for a 14 mile, ten-inch line to originate at its Plymouth plant and to terminate at a tie-in with the McCamey-Houston pipe line.

Phillips Pipe Line Company plans to build a 35 mile, six-inch pipe line from Okmulgee, Okla., to Tulsa.

West Texas Gulf Pipe Line Company has begun right-of-way work on an 80-mile section between Colorado City and Midland, Texas. Anderson Brothers Corporation, Houston, has been contracted to build the new 24-inch line.

Natural Gas Lines

Arkansas Louisiana Gas Company has applied for FPC permit to build a line from a connection with the Mississippi River Fuel Corporation line to Humnoke, Ark.

Chicago District Pipeline Company has authorized Contracting and Material Company, Evanston, Ill., to add about 13 miles of 30-inch pipe from a connection with Texas Illinois Natural Gas Pipeline's system near Elgin, to the Chicago area.

Cities Service Gas Company has applied to FPC for permit to build 16 miles of 20- and 16-inch pipe from Tonganoxie compressor station in Leavenworth County, Kans., to Hung pipe line junction.

City of Long Beach, Calif., has awarded contract to Southern Pipe & Casing Company to build 14 miles of 14-inch line between Huntington Beach field and Long Beach, Calif.

Colorado Interstate Gas Company is planning the construction of 100 miles of line from the Denver-Julesberg area to a terminus in Denver.

Iowa-Illinois Gas & Electric Company has applied to FPC for approval of 22 miles of eight-inch line to connect Natural Gas Pipe Line's system to Ottumwa, Iowa.

Kansas Nebraska Natural Gas Company has requested FPC permit to build 152 miles of 6- through 16-inch line in Nebraska and Kansas. The proposed line would link Hastings and Grand Island, Nebr., with 16- and 12-inch line; and would connect Atwood with Oakley, Kans.; extend the line south of Holdrege, Nebr.; link North Platte to Ogallala, Nebr.; add line near McCook, Nebr.; and install miscellaneous line in the Hugoton field.

Lone Star Gas Company has applied for FPC permit to install five miles of 12-inch storage line to New York City field reservoir in Clay County, Texas, as well as an additional 2640 horsepower in compressor stations.

Mountain Fuel Supply Company has applied to FPC for permit to build a 2640 horsepower compressor station near Lyman, Wyo.

New York State Electric and Gas Corporation, Ithaca, has applied for FPC permit to build 25 miles of ten-inch line to originate from a connection with New York State Natural Gas Corporation system and run through Norwich to Oneonta, N. Y., and 24 miles of eight-inch to connect Auburn to Seneca Falls, N. Y. Also included is the addition of 2200 horsepower in compressor unit at Auburn, and ten miles of ten-inch parallel line between Auburn and Seneca Falls.

Ohio Fuel Gas Company has requested FPC approval on 35 miles of 20-inch line to originate from a connection with Texas Eastern Transmission and to run to a point near Johnstown, Ohio. Construction is scheduled for March, 1953.

Ohio Fuel Gas Company has contracted Ohio Pipe Line Construction Company, Granville, Ohio, to build 33 miles of 20-inch line from Leesburg to Berwick, Ohio. This line will replace an existing 8- and 10-inch line.

Ohio River Pipeline Corporation has received FPC approval on 13½ miles of eight-inch pipe originating at a connection with Texas Gas Transmission Company's 26-inch line at a point east of Louisville, and extending to the north bank of the Ohio River and on to Utica, Ind. The project includes two eight-inch river crossings.

Piedmont Gas Company, Inc., has filed for FPC permit to build 28 miles of six-inch line from a connection with the Transcontinental Gas Pipe Line Corporation system in North Carolina.

St. Charles Gas Corporation has filed for FPC permit to build a line from the Mississippi River Fuel Corporation system in Madison, Ill., to St. Charles, Mo.

Texas Eastern Transmission Corporation has asked FPC permit to lay a permanent 24-inch line in the Arkansas river bed below Little Rock, Ark.

United Gas Corporation has been authorized by FPC to add 13,280 new compressor horsepower along its line from Napoleonville, La., to Kosciusko, Miss., at Napoleonville, La., and Jackson, Miss.; with 8000 horsepower to be added to stations at Montpelier, La., and Walthall County, Miss.

Utah Natural Gas Company plans to build 360 miles of line, including a line from the San Juan basin to Salt Lake City, and a section from the Last Chance field, Wayne County, Utah, running through Sevier and Sanpete Counties.

Westcoast Transmission Company, Ltd., has received approval from the Canadian Board of Transport Commissioners on its proposed $111 million pipe line to Vancouver, B. C. All other systems proposed for the purpose of exporting gas to the Northwest U. S. were turned down for the time being.

Western Slope Gas Company, Denver, plans 49 miles of main transmission line and 30 miles of gathering line from Douglas Creek, Germesa, Higline Canal and Asbury Creek fields with termination at Grand Junction, Colo.

Product Lines

Gulf Pipe Line Company plans this year to add connecting lines from its Port Arthur-Lufkin system to Project Five Pipe Line Corporation's line.

Phillips Petroleum Company is planning the installation of five miles of eight-inch line in Utah to connect the Woods Cross refinery and the Salt Lake City pump station.

Phillips Petroleum Company has announced it will add 57 miles of 8⅝-inch line in three loops along the Mex-Tex gasoline line between Odessa and Borger, Texas.

Sinclair Pipe Line Company is building 89 miles of 16-inch line for its Harbor Products System between Philadelphia and New York harbor. The 110,000 barrel-a-day project includes 14-, 8- and 4-inch feeder lines.

Suntide Refinery Company, Corpus Christi, Texas, has announced plans to build two 14-inch and one 8-inch lines, each about six miles long, between the Suntide refinery and the Sunray Coastal Pipe Line Company terminal.

Texas Pipe Line Company has been granted pipe allotment by PAD for 198 miles of 16-inch line from Port Arthur, Texas, to Baton Rouge, La.

Projects Starting

Crude Lines

Cooperative Pipe Line Company, Kansas City, has authorized construction of 48 miles of six-inch line from Holdrege, Nebr., to Phillipsburg, Kans., for early

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next month. PAD has allocated sufficient pipe to complete the project.

Interstate Oil Pipe Line Company has authorized L. E. Farley, Inc., Houston, to begin construction of 64 miles of 16-inch line from Bateman Lake to Baton Rouge, La., early next month.

Pasotex Pipe Line Company has received third quarter allotment from PAD for construction on the 195 mile eight-inch parallel line between Wink and El Paso, Texas. Completion is scheduled for the fourth quarter.

Reef Field Gasoline Corporation has begun laying 100 miles of pipe along its new gathering system in Borden and Howard Counties, Texas. C. O. Holder Construction Company, Snyder, Texas, is doing the work.

Shell Oil Company last month began construction of 15 miles of gathering system near Victoria, Texas. Gulf Welding and Machine Works, Conroe, Texas, is doing the work.

Natural Gas Lines

Arkansas Louisiana Gas Company has scheduled the laying of six miles of outlet line from the Scottsville gas field, Harrison County, Texas, to its plant.

Colorado Interstate Gas Company has been authorized by FPC to start a proposed eight miles of gathering line in the Keyes and South Keyes fields in Cimarron County, Okla.

Texas Gas Transmission Corporation has started work on the new 408 mile, 26-inch pipe line which will stretch from Bastrop, La., to Louisville, Ky. FPC authorized the $33.7 million project last month and construction crews from H. C. Price Company, Bartlesville, Okla., and Houston Contracting Company, Houston, began work on the 125 mile section from Greenville to Lake Cormorant, Miss. In addition, two new compressor stations will be erected at Shreveport, La., and Dillsboro, Ind.

Toledo Edison, Ohio, had H. L. Gentry Construction Company, Jackson, Mich., begin work on ten miles of six-inch line near Defiance, Ohio, this summer.

Union Gas Company of Canada, Ltd., began work this month on seven miles of four-inch line connecting Wardsville, to Glencoe, Ontario. The line, under construction by company forces, is scheduled for completion in October.

Product Line

Southern California Edison Company had J. E. Young Pipe Line Contractor, Los Angeles, begin two sections of line in California. Forty miles of ten-inch line start at Santa Fe Springs and terminate at Etiwanda, Calif. Nine miles of 12- and 16-inch line originate at Colton meter station and run to the Southern California plant at Etiwanda. Pumping stations at Santa Fe Springs, Brea, and Chino, Calif., are included in the project.

Projects Completed

Crude Lines

Service Pipe Line Company will complete 33 miles of 16-inch loops from Bowie, Texas, to Drumright, Okla., sometime this quarter to achieve a 19,000 barrel increase in daily crude carrying capacity.

West Texas Gulf Pipe Line Company was scheduled to complete in August, 38 miles of 20-inch line originating from a connection with the West Texas Gulf Pipe Line Company's line at Wortham, Texas, and running to Longview, Texas. This section was built by Panama Williams Company, Houston.

Natural Gas Lines

Algonquin Gas Transmission Company expects to complete 40 miles of 6- through 12-inch lateral lines between Dover, E. Baintree and Brockton, Mass., by September 15. James H. Merritt Contracting Corporation, Hyde Park, Mass., is doing the work.

Saskatchewan Power Corporation was scheduled last month to complete 16 miles of 4½-inch line from Brock gas field to Kindersley, and a two-inch line, three miles long to Brock. Bannister Construction, Ltd., Edmonton, did the work.

Product Line

Susquehanna Pipe Line Company has been granted pipe allotment by PAD to complete 120 miles of eight-inch pipe line from Fostoria to Randolph, Ohio. The project is scheduled for completion September 30.

"Welding 8" line preparatory to shoving across a South Louisiana marsh"

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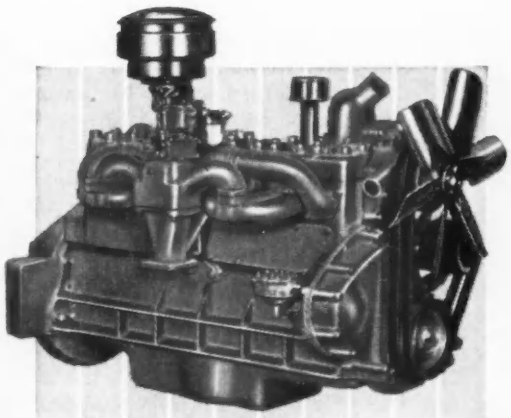
MODERN TWIST *on a pump handle*

Photo—Courtesy Western Land Roller Co., Hastings, Nebraska

discharges 1050 gallons of water a minute from 100 feet down!



This 8-inch Deep Well Turbine Pump is furnishing water for irrigation purposes near Hastings, Nebraska. It is powered by a Model 8-A Chrysler Industrial Engine with right angle gear drive.

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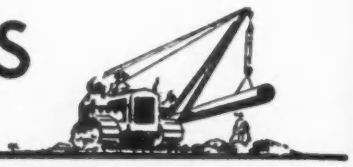
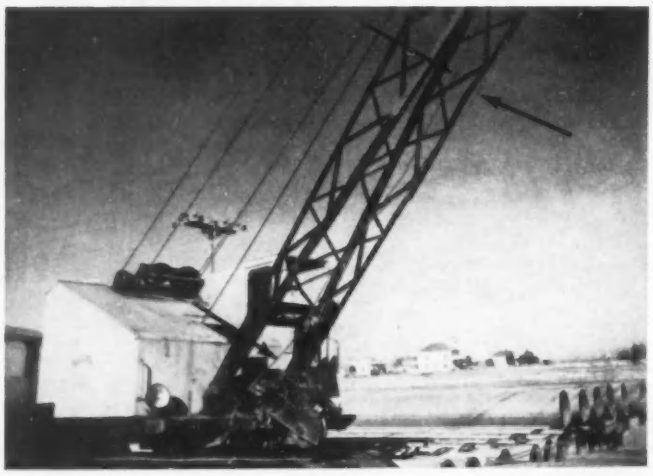


$10 is paid for each illustrated acceptable contribution. Mail to The Editor, WORLD OIL, P. O. Box 2608, Houston 1, Texas

Check Guys Prevent Boom Failures



Two wire ropes attached to the mid-point of a crane boom can eliminate the possibility of damaging the boom by throwing it back over the cab.

There are two principal causes of boom failure on a crane. One is picking up a load too heavy for the crane. The other is dropping—or suddenly releasing—a heavy load which causes the natural spring of the boom rigging to throw it back over the cab. The latter cause accounts for many boom failures.

On a pipe line job, where pipe is becoming heavier by the job, this form of boom failure must be prevented. A simple solution was devised by Oklahoma Contracting Company. Two preventer guys were run from the base of the crane to the approximate mid-point of the boom.

The guys were cut to equal length and crisscrossed. They are fastened to the crane through holes burned in the framework, and to the boom through holes in two lugs welded onto the angle iron structural members. The guys are loose until the boom approaches vertical position.

Beveling Machine Rack Made of Pipe

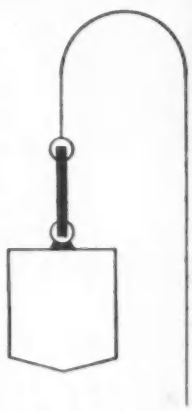
Use a short length of line pipe, some steel plate and angle iron to make a combination beveling machine rack and cabinet for storing welding rod, hose and beveling machine tips.

Make the rack from a short pup joint of pipe — about three feet will do. Close one end of the joint by welding a light gauge circular steel plate over it. Make a door at the other end as shown in the photo. The hinges for the door are made of half-inch rod, bent into small circles. Slip the rods through the holes in the door and weld them to the cabinet, on the outside. Then lift the door and make the inside welds.

A rectangular plate of 3/8- or ½-inch steel makes a good base for the rack. Weld four upright lengths of 2 x 2 angle iron to the plate and to the rack. These should be spaced at either end so the chains that hold the beveling machine in place will pass on the inside of the legs. This keeps the beveling machine from sliding off one end of the rack.

The rack is heavy enough that it does not necessarily have to be bolted to the truck or pickup bed.

Wood Link Saves Steel Float Line



Installing a six-inch-long wooden link between an aluminum float and steel float line wire added almost a year's life to floats inside crude oil tanks for one pipe line company.

The floats actuate the automatic gauges on sour crude tanks. Before the wooden linkage was installed, the float line had to be changed every three or four weeks, and in the course of a year, four floats were lost in the tank.

Once the wooden link was added the wire was left in service for a year. At the end of this time, it proved to be in good condition.

The linkage is simple. It is a 6-inch piece of hardwood, ½ inch thick and 1¼ inches wide. It has a 5/16-inch hole ¾ inches from each end. The aluminum ring on the float is cut, opened and inserted in the hole and closed. The steel ring on the line was attached in a similar way.

The explanation for the savings in gauge line and float is that the two dissimilar metals, in contact with one another in a corrosive atmosphere, set up a chemical reaction which eats the steel wire apart.

Shade Follows As Welder Works

One of the problems of those in charge of pipe line construction is keeping the traditionally high-strung welders happy. This problem is especially acute where the stringer-bead welders are concerned. They are the prima donnas of the pipe line who set the welding pace for the entire job.

Here is an awning that can contribute to the over-all picture by providing a spacious shaded area which moves along with the job. It keeps the sun off the welders' necks and backs.

Here's the way you construct it. Weld a four-foot length of three-inch pipe to the work side of front bumper of the stringer-bead truck. Brace it at bottom with two gusset plates and near the top with a three-foot piece of one-inch pipe also welded to the bumper.

Make the upper portion of the framework from one-inch and two-inch pipe. The vertical two-inch pipe member is six feet long. The horizontal piece is eight feet long. The two are braced as shown.

Three six-foot long pieces of one-inch pipe support the canvas which is stretched over a light wooden frame.

Once the device is in proper position, burn a ¾-inch hole through the three- and two-inch pipe about two feet above the bumper. A bolt can be stabbed through the two pieces of pipe to keep the awning from turning as the truck travels down the line in 40-foot jumps.

Note how the welding leads are suspended at convenient height above the welders' heads.

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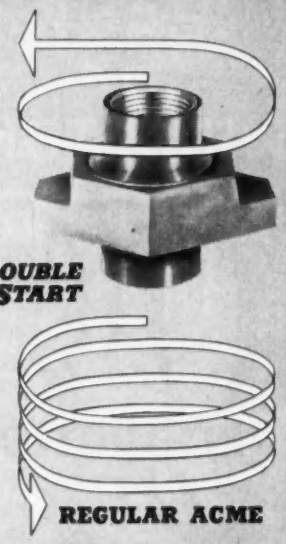

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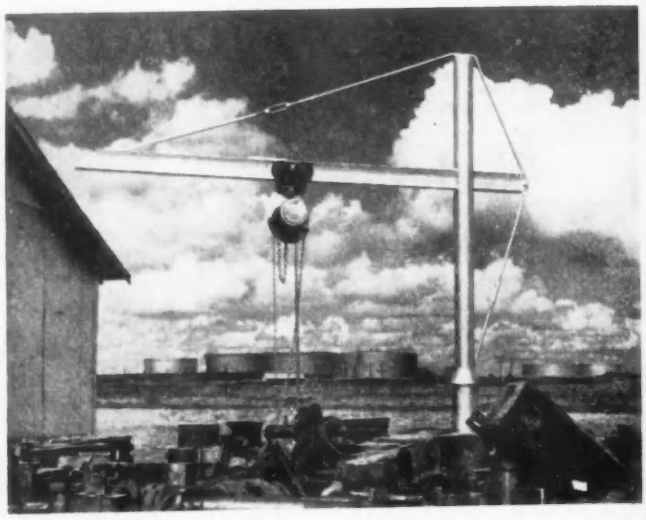

A movable crane which takes the hard labor out of loading valves and heavy steel parts on or off storage platforms can be made of used pipe, provided it is heavy enough.

To erect the crane, first make a base of eight-inch pipe. Seal the lower end with a heavy circular steel plate, and set it in concrete at least six feet below ground.

The upright pipe section should be made of extra heavy six-inch pipe. The lower end is machined to a smooth flat finish so it will turn on the supporting steel plate. Weld steel lugs to the six-inch pipe about three feet apart to center it inside the eight-inch. (Later the annular space between the two pipes will be filled with oil.)

Weld a skirt of light gauge over the opening where the six-inch goes inside the eight-inch pipe. This keeps water out.

A piece of heavy eight-inch I-

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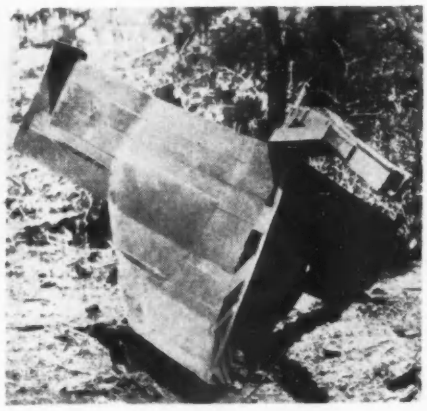
beam serves as crane rail. It goes through the six-inch pipe and is welded to it on both sides. The bracing is made of 7/8-inch hog rod and turnbuckles.

The chain hoist is kept on the rail by a bolt at the end of the I-beam.

For any installation, station employes should be advised of the safe load the hoist and crane will safely support.



Marsh Plow Digs Furrow for Pipe

A marsh plow that can cut a pipe line ditch through marshlands as fast as a marsh buggy can pull it can be made in almost any shop. The purpose of the plow is to cut a three-foot-wide path through the one-foot-thick soil and grass root crust that floats on top of the marsh water. Once the path has been cut, pipe-liners float miles of pipe line into place, then sink it in the two- to six-foot deep water of the marsh.

To make the plow, fashion a framework out of channel and angle iron. Shape the center part to uproot the soil and grass. Add wings at the back sides to force the uprooted material away from the ditch.

The drawbar should be made of channel iron with steel web to form a steel member with a square cross-section. Brace it at the acute angle with steel strap to resist the pull.

Cover the frame with eighth-inch steel plate. To form it, cut the plate in six-inch wide strips, shape each one by hand and weld it to the frame. Then make a cutting edge at front of the plow. This edge can be made of light gauge metal and braced as shown in the photo.

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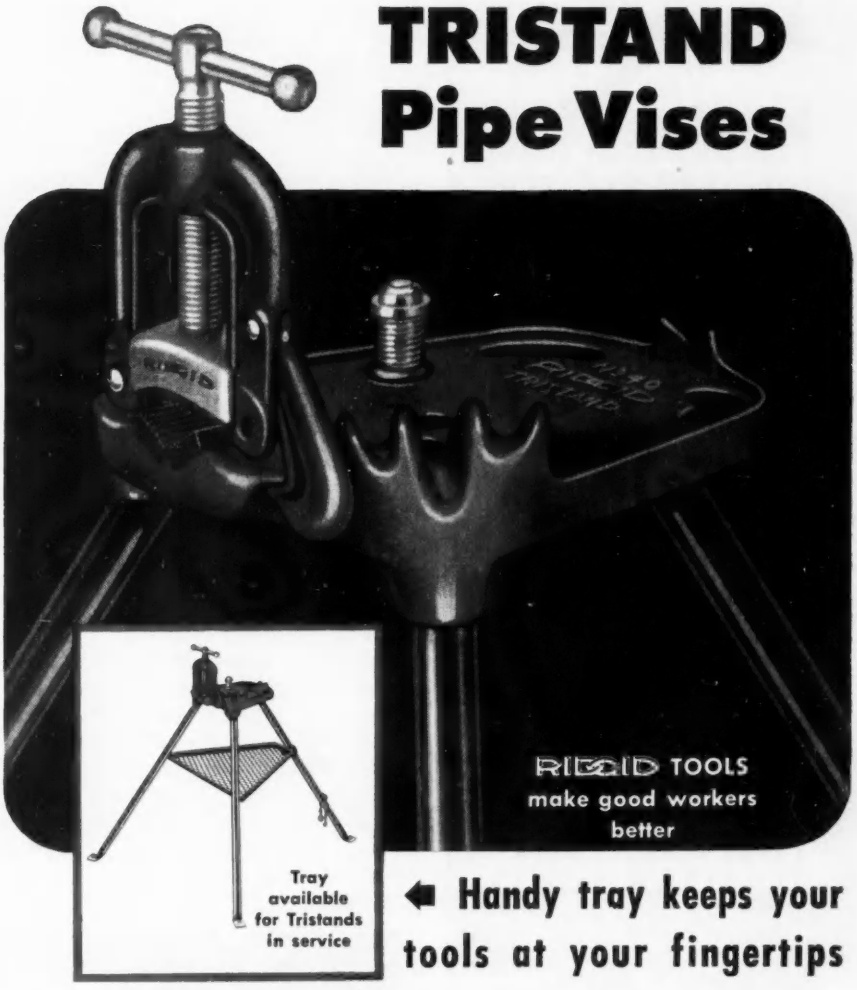

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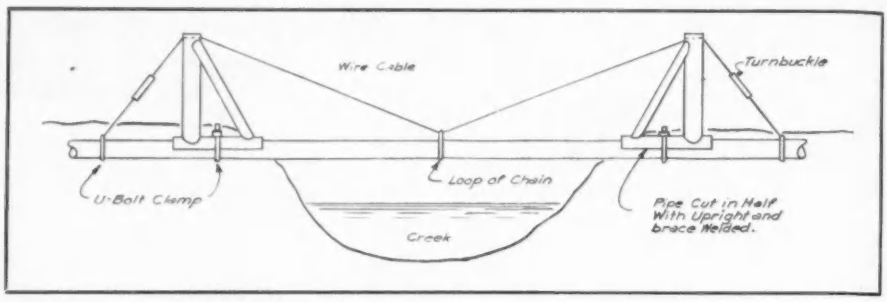

This Crossing Requires Few Manhours

A self-supporting creek crossing which can be installed by three men in half a day can be made in almost any pipe line maintenance shop. The support requires no concrete pours and no dead men anchors. It can be installed without the services of a welder.

The method of supporting the span is illustrated in the drawing. The size of upright stanchions and the size of wire rope are dependent on the size of line pipe and length of span.

To make the uprights, cut a short length of pipe in half, horizontally, for a base. Saddle on to it a length of pipe for the upright stanchion. Brace this as shown with a smaller diameter piece of pipe.

To keep from cutting the wire rope which will be stretched over the stanchions, make a cableway of two-inch pipe. This is made by bending a short length of the pipe to the angle which the wire rope will make where it passes over the stanchion. After bending, cut the pipe in half lengthwise, and weld it to top of the stanchion. Clamp the stanchions to the line well back from the creek crossing as shown.

Then stretch the wire rope loosely across the span. Chain it to the line pipe where supports are desired. Then using U-bolts, clamp the wire rope to the line pipe. Tighten the line with a "come-along" to remove slack, then adjust height of the pipe at center of the span using the turnbuckles at each end of the wire rope. Paint and dope the entire portion of the installation to be underground, and backfill.

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Geologists to Meet in Algiers

Outstanding Members of Profession Will Gather This Month For French-Sponsored 19th International Geological Congress

By DR. J. BRIAN EBY
Consulting Geologist, Houston

MANY of the world's top-notch geologists will convene this month at Algiers, Algeria, for the French-sponsored 19th International Geological Conference. The congress is expected to have one of the largest American attendances of any of the congresses to meet east of the Atlantic Ocean. Preliminary reports indicate that more than 60 geologists from the U. S. will attend—about half the number expected from France and slightly more than the number scheduled from the various parts of Africa.

The American Association of Petroleum Geologists, the largest organization of its kind in the world, will be represented by nine delegates appointed by AAPG President Morgan Davis, vice president of Humble Oil and Refining Company, Houston. The delegation will be headed by David Perry Olcott, Houston geologist.

Other members of the delegation are Dr. Hollis D. Hedberg, Gulf Oil Corporation, New York; Dr. Rene Engel, International Petroleum Consultants, Pasadena, Calif.; Dr. E. Willard Berry, professor of geology, Duke University, Durham, N. C.; John H. Beach, Oceanic Oil Company, Bakersfield, Calif.; D'Arcy M. Cashin, Dr. Jan P. Schumacher and Dr. J. Brian Eby, Houston geologists; and Paul Charrin, Houston geophysicist.

General chairman of the congress, the theme of which will be sedimentary and igneous rocks of North Africa, is Professor M. Charles Jacob of the Academy of Science, the Colonial Academy of Science and honorary professor of geology at the Sorbonne, in Paris. Excursions before and after the congress will take delegates to Tunisia, Morocco, the interior of Algeria, and into the Sahara desert. On hand to direct both the congress and the excursions will be a staff of French and African geologists.

Origin of the congress dates from 1876, when the American Association for the Advancement of Science passed a resolution in Philadelphia while the Centennial Exposition was in progress calling for a committee to arrange for a geological assembly in Paris during the French capital's 1878 International Exposition. World-wide fame of the Philadelphia Centennial, attended by almost 10 million visitors, pointed to the need for scientific and intellectual international cooperation.

The founding committee for the proposed Paris meeting was headed by James Hall, state geologist of New York for many years and one of the founders of American geology. His secretary was T. Sterry Hunt, Montreal, the geologist given credit by many as proposing the anticlinal theory of oil and gas accumulation.

Other members of this group were William B. Rogers, J. S. Newberry and C. H. Hitchcock of the U. S.; J. W. Dawson and R. Pumpelly of Canada; T. N. Huxley of Great Britain; Otto Torrell, Sweden, and E. H. de Baumhaver of Holland. In 1877 an organization was perfected in Paris to arrange for the first congress the following year, and letters were sent geologists throughout the world.

The first Paris meeting was presided over by H. Herbert, professor at the Sorbonne. James Hall and Peter Lesley were elected vice presidents from the U. S. Ten Americans attended the Paris sessions, incuding T. C. Chamberlain, who later attained fame as a geologist and author with the University of Chicago. The Tertiary rocks of the Paris Basin received special attention at this convention.

An interesting sidelight was furnished by geology Professor J. Capellini, University of Bologna, Italy. He brought to Paris correspondence showing that in 1874 he had written

THE INTERNATIONAL GEOLOGICAL CONGRESSES

No.	Year	City	Country	Presidents
1	1878	Paris	France	E. Hebert
2	1881	Bologna	Italy	G. Capellini
3	1885	Berlin	Germany	E. Beyrich
4	1888	London	England	J. Prestwich
5	1891	Washington	United States	J. S. Newberry
6	1894	Zurich	Switzerland	E. Renevier
7	1897	St. Petersburg	Russia	A. Karpinsky
8	1900	Paris	France	A. Gaudry
9	1903	Vienna	Austria	E. Tierze
10	1906	Mexico City	Mexico	J. G. Aguilera
11	1910	Stockholm	Sweden	G. de Geer
12	1913	Toronto	Canada	F. D. Adams
13	1922	Brussels	Belgium	J. Lebacz
14	1926	Madrid	Spain	C. Rubio
15	1929	Pretoria	Union of South Africa	A. W. Rogers
16	1933	Washington	United States	W. Lindgren
17	1937	Moscow & Leningrad	Russia	I. M. Goubkin
18	1948	London	England	H. H. Read
19	1952	Algiers	Algeria	M. Charles Jacob

LEFT. Excursionists examine rock outcrops near Pretoria, Transvaal, Union of South Africa, during International Geological Congress of 1929. RIGHT. Union Building in Pretoria, site of 1929 International Geological Congress. Photos Courtesy J. T. Singewald, Jr., Johns Hopkins University

his own government urging that an international congress of geologists be invited to meet at his university at Bologna. That was two years before the resolution of the American Association.

In deference to his invitation, the Second International Congress convened at Bologna in 1881.

The Berlin, London, Washington and Zurich, congresses followed in that order at three-year intervals. However, the Russian congress held in St. Petersburg (Leningrad) in 1897 was the first to receive outstanding government recognition and sponsorship. By order of the Czar, Nicholas II, who reached his throne three years before and lost it 20 years later, all transportation, maintenance and expenses of all delegates while in the country were provided and paid for by the Russian government.

Following the second Paris meeting in 1900 and Vienna in 1903, the Mexico City Congress of 1906 was held amid national fanfare and recognition. The Mexican government, under the long presidency of Porfirio Diaz, received the visiting geologists with hospitality. And, as the Russians before them, the Mexicans paid all delegate expenses from border to border. The disastrous San Francisco earthquake of April that year was a principal topic.

Stockholm and Toronto, 1910 and 1913, were the last congresses to precede World War I. Brussels picked up the threads in 1922. There it was agreed to hold future congresses on four-year intervals changing from the original three-year interim, and Spain was elected for the 1926 sesions. The Rio Tinto mines were a focal point of interest.

The first African Congress reverted to a three-year interval, meeting in Pretoria, Union of South Africa, the summer of 1929. Sessions were held in the Union Building, and high points of interest were the Kimberly diamond workings and exhibits of diamonds in their native state. Excursions to various rock outcrops of the Transvaal were made.

William E. Wrather, director of the U. S. Geological Survey at Washington, and Paul Charrin, president of the Perforating Guns Atlas Corporation, Houston, both AAPG members, attended the Pretoria meeting and will attend the Algerian Congress. Charrin will read a paper entitled "Radiation Logging and Its Application in the Oil Field."

The U. S. was host to the Congress in 1933, with Washington the seat of the sessions. However, much of the summer was devoted to trans-continental field trips and visits to famous New York classic geologic rock sections and other Atlantic coast areas of interest. The world-wide depression was not yet over and foreign attendance was below expectation. The eminent Professor Waldemar Lindgren of Massachusetts Institute of Technology served as president.

Russia invited the Congress in 1937. Both Leningrad and Moscow were designated as meeting places. Dr. I. M. Goubkin served as host president. The late J. Elmer Thomas, geologist of Fort Worth, Texas, who made the trip, often commented on the politeness and generosity of the individual Russian as opposed to the strict regimentation of the population and the travel plans of the delegates. The geologists' visit to Russia marks one of the few occasions wherein the "Iron Curtain" has been lifted if only momentarily, from the late '20's to the present time.

The London meeting of 1948 was widely attended by Americans and Europeans. Trips were made to all corners of the British Isles. British hospitality, despite post-war austerity, recaptured much of the spirit of scientific camaraderie that, from all reports, stimulated and inspired the first London Congress in 1888, 60 years before.

About the Author

DR. J. BRIAN EBY, consulting geologist, will attend the Nineteenth International Geological Congress at Algiers, Algeria, Sept. 8-15, and will act as a special editorial representative of WORLD OIL. He is one of the official delegates selected by the American Association of Petroleum Geologists, the largest organization of its kind in the world.

In 1933 Dr. Eby visited the North German salt dome basin as WORLD OIL representative. While in Europe, he attended the International Petroleum Congress at London as a representative of WORLD OIL. Subsequent European visits in 1945 and 1946, also in behalf of WORLD OIL, took him to the German and Austrian oil regions primarily.

Born in Littlestown, Penn., Dec. 18, 1896, Dr. Eby received his A.B. degree from Johns Hopkins University in 1918, and his Ph.D. in 1922. From 1919 to 1925, he was a geologist with the U. S. Geological Survey, and became geologist in charge of Shell Petroleum Corporation's geophysical department of the Gulf Coast Division in 1925. Six years later he entered consulting work. Dr. Eby is a member of many scientific organizations.

The seismograph goes North

By JAMES JOSEPH

Bureau Chief, Western Roundup
Los Angeles

This is typical camp in muskeg. Each Canol house accommodates four men. Electricity is supplied by gasoline-driven generator.

20 Days in and 10 Days Out

Companies Find the Formula for Contented Field Party Crew Members: Give Them Best Possible Conditions and Production Will Spiral

Two Slavey Indian crewmen offer home-made variety of entertainment for Canadian and American seismologists in far northern camp.

"IT'S a young man's game," G. L. Knox, president of The California Standard Company, said in his Calgary, Alberta, office as he swept a hand toward a map of northern Alberta. "You've got to be young and vigorous to take it—and to like it in the muskegs."

Knox knows what he's talking about. The muskeg, bone-hard and snow-crusted, stretches endlessly toward the Arctic Circle north of Peace River, where the Northern Alberta Railway ends. Scattered through the muskeg are about 60 seismological parties. Ahead of them, traveling in skid-houses dragged behind tractors, are the bulldozer crews.

The nomadic dozer men have the toughest time of it, mostly because they have few comforts of civilization. Beards are necessary protection against 30- to 50-below-zero temperatures and biting winds.

Youth, wise to the ways of the north, runs the northern operation for

LEFT. Day's work is evaluated. Here Bob Shaller, rear, chief of Party 325; George Choukalos, first computer, and Lorne Dartnell, foreground, second computer, survey work.

RIGHT. Radio is sole means of communications between muskeg camp and field office at Peace River.

the oil companies. Young men form the advanced staffs which work in newly set up offices in Peace River, 350 miles north of Edmonton—and the jumping off place for bush exploration.

Of the 152 geophysical parties working in western Canada, 63 are headquartered and supplied out of Peace River. The work formula is: "20 days in; 10 days out," meaning that crews probe the bush for 20 days, then are flown or trucked out to civilization. For human logistics play a big part in the increasingly successful work schedules of bush parties. Ten-day layoffs have kept efficiency high.

Food Rated at Top

Being "bushed" has real meaning in the north. A-1 priority goes to food and for top-rate camp cooks. Relatively high pay is the next most important factor. Living conditions follow close behind.

Last December, just before Christmas, a chief of a party and two other crewmen set out in an all-track for the MacKenzie highway, 50 miles from their muskeg camp. It was 50 below zero and four miles from the highway the motor stopped. It took them three hours to trudge the four miles through 12 inches of new snow to reach the road. They found shelter and got a fire going by burning some grease-covered overalls and a pair of old socks. They melted snow in a pot, found a half used can of maple syrup, and split the foul-tasting concoction. Finally, nursing frost-bitten hands, and after tearing every loose stick out of the shelter for firewood, a truck passed—and took them to safety. Such experiences are routine in the bush country of northern Alberta.

$25,000 a Month

California Standard, though not the largest exploring outfit in the bush (Imperial Oil Ltd. is bigger), has six parties working. All are contract crews. Standard supplies the camps, radio communications, aircraft link-up and food.

The average seismological crew of 25-30 men, plus muskeg camp, costs a company about $25,000 monthly to supply and maintain.

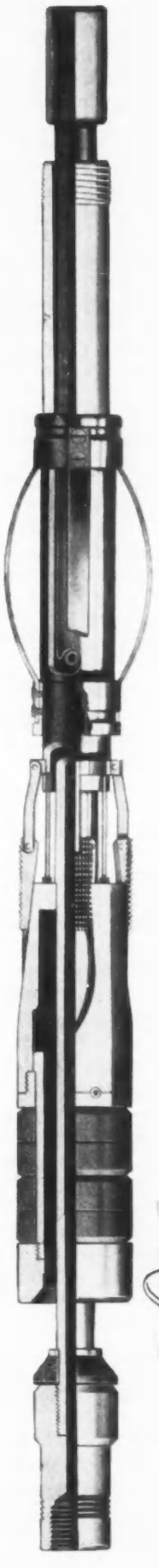
The 20-day in, 10-day out formula seems to be working well. "There's no reason to lay off Sundays," a crewman said, "there's nothing to do anyway."

The exploring companies' vast expenditure of money and energy is being spent on the geological suspicion that good oil-producing structures extend north from the proven Leduc and Redwater fields near Edmonton. Possibly they extend north beyond the Arctic Circle. The Norman Wells development, which supplied the Canol Project during World War II, seems to indicate the northern extremity of possible oil reefs may reach well into the Northwest Territories. Few companies have extended operations into the Northwest Territories, but next winter's operations likely will find more crews there.

This is the third in a series of articles describing the movement north of seismograph exploration in the continuing effort to discover oil beneath the Arctic muskeg.

200 Wells Drilled

Approximately 200 wells have been drilled at various times on the fringes of the northern Alberta muskeg around Peace River. Only three, all one-well fields, have shown any promise—Imperial's Normandville 1, discovered September, 1949, in Devonian D-3 reef, 26 miles south of Peace River; Imperial's Belloy 2, discovered August, 1951, in Permo-Pennsylvanian sandstone 44 miles



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southwest of Peace River and which has produced about 3000 barrels; and Shell-British American Whitelaw 1, discovered August, 1950, in Permo-Pennsylvanian sandstone about 36 miles west of Peace River. Newest discovery was reported from the Fort St. John area, west of Peace River, where Pacific Petroleums-Allied, Fort St. John 1 came in during 1951 in Permo-Pennsylvanian limestone—the first major British Columbia find.

A few gas discoveries have spurred seismographic crews. These include several currently suspended wells: Hudson's Bay-Union's North Tangent 1, completed in February, 1951, 25 miles southwest of Peace River; Hudson's Bay-Union-Texaco's 1 near Hamelin Creek, approximately 65 miles west and slightly south of Peace River, and several other small discoveries.

The long-known Athabasca oil sands are further encouragement to exploring crews.

Area Breakdown

The six companies holding the largest provincial petroleum (exploration) reserves in Alberta are fielding seismographic crews in proportion to their reserves. As of February, 1952, Imperial Oil Ltd., held 10,420,356 acres; The California Standard Co., 5,046,137 acres; Socony-Vacuum Exploration Co., 4,273,237 acres; Shell Oil Co., of Canada, 3,703,446 acres; Hudson's Bay Oil and Gas Ltd., 3,323,240 acres; and Canadian Gulf Oil Co., 3,235,671 acres. North of Peace River, The California Standard Co. has about 3½ million acres under reservation (exploratory) lease compared to Imperial's 6-7 million acres.

A couple of flying-hours north of Peace River is Upper Hay River camp No. 2, operated for California Standard by the Geophysical Service, Inc.

Technically, this was GSI party No. 325 and an excellent one to visit because, being specially equipped with all-track vehicles, crew 325 intends to stick out the boggy, treacherous summer operation. This will be an experimental operation because usually geophysical crews either leave the summer muskegs or move to high ground.

Party 325's camp is a huddle of small shacks, many of them still stenciled with the word "CANOL." Four men live in each shack and sleep in double-decker beds. A big wall tent, heated by wood stove, is the camp's garage and maintenance headquarters and is large enough to hold the largest all-track vehicle. Heated by coal-oil stoves, the shacks boast electric fans above the upper bunks.

James Joseph, author, learns that mittens make handling of camera no simple matter.

"That's because the guys on top would roast if we didn't circulate the air," someone explained.

"This camp," youthful Bob Shaller, party chief, said, "is a palace compared to the tent camp we had in past years. We're really living now!"

As living standards rise, so does production. More holes are being drilled and shot daily since crews moved into semi-permanent camps. Party 325's production is up from six holes to as many as 12 a day, during the single 7 a.m. to 7 p.m. shift. Crews usually spend 220 hours a month in the field before being evacuated to civilization for the ten-day rest period.

Crew 325's messhall, constructed by shoving a couple of "Canol cottages" together, is lined along two walls with tables, neatly covered with white oilcloth. At night there's an occasional poker game and almost all camp entertainment is crew-concocted. Radio reception is only fair.

Cooks Important

"The cook is the most important guy in this camp," said Shaller. "Production lies in the pit of a man's stomach."

Actually, there's little recreation save eating and sleeping. That's why good cooks and non-temperamental ones, are so important. Party 325's cooks get out hearty meals of pork chops, mashed potatoes and fancy, home-made pies. There are no limits —and "seconds," even "thirds," are welcomed.

Any crewman can reach into a score of canned goods boxes under the tables, and legally "swipe" a can of tomato or apple juice any time he chooses. Field crews make up their own noon lunches. Explained the cook, "Let them fix their lunches and they don't complain. Nobody gripes about sandwiches and stuff he fixed up himself."

Three times a week the bright yellow monoplane skids down for a ski landing, bringing in supervisors, equipment and supplies. Usually, the cook orders enough food to last the 20-day "in" period at the first of each month. Food is trucked in, or brought by plane. Trucking involves a 250-mile trip up the MacKenzie highway from Peace River, then another 40 jolting miles over bulldozed muskeg trails.

But Party 325 does boast of one modern convenience: a wash house with running water, a hot shower (baths are usually rationed, one or two a week). There's also a washing machine. The camp attendant washes sheets and pillow cases, but the machine is for the use of field crews, too. Bath rationing is necessary because all water must be hauled from a river, four miles away.

Drinking Water

Drinking water, which comes out of a hole cut in the river ice, is sometimes sedimented. But you drink it, anyway—and take a typhoid shot just in case. River water, no matter how foggy, is better tasting than melted snow.

Three of Party 325's members are Americans, including Chief of Party Shaller and the field foreman. All the rest are Canadians. Many of the camps have all-Canadian parties.

Said one American, "You can't tell a Canadian from an American without a guide book." This explains the A-1 camp relations between party members of two nationalities.

With civilization somewhere 350 miles to the south, the camp's cook fed garbage to a score of fat rabbits. "I'm fattening them up—just in case," he said.

Seems that last season Party 325 was caught in the muskeg during the break-up, and was isolated for four weeks. Food ran out. Roads were impassable. Planes couldn't land on the disintegrating airstrip.

So the chief of party armed the crew Indians with sling-shots, and sent them out for rabbit. This was old stuff to the Slaveys, who before oil made their living by hunting.

For 14 days the men ate rabbit meat.

"We're going to have fat rabbits this time," vowed the cook. "Not those skinny devils like last year."

Announcement by

Anglo-Iranian Oil Company, Limited

IN ORDER THAT there should be no misunderstanding as to the scope and effect of the recent decision by the International Court of Justice in respect of the Iranian oil dispute Anglo-Iranian Oil Co., Ltd. wishes to bring the following statement to the attention of all concerned.

It has already been made clear that the decision of the International Court is not a decision on the merits of the case and that it does not in any way affect the Company's claim that the Iranian Government has acted illegally towards the Company in Iran. The decision means simply that the International Court, which only has jurisdiction to the extent that individual states have either generally or in a particular case accepted the jurisdiction of the court, has decided after considering the arguments advanced by both sides that it has no jurisdiction in this case.

The Company's title to crude oil and oil products derived or to be derived from the area of its operations in Iran is in no way affected by the decision. In attempting to deprive the Company of this title and appropriating to itself the Company's properties in Iran the Iranian Government has acted in complete disregard of its solemn obligations to the Company and of the basic principle of the sanctity of contracts—a principle which is essential for maintenance of the necessary confidence for the continued development of world trade.

In these circumstances the Company remains confident no oil company of repute nor any tanker owners nor business men of standing will countenance any direct or indirect participation in the unlawful actions of the Iranian Government.

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J. E. Brantly

Continuing Need

On these pages are published in full the addresses delivered recently by two Petroleum Administration for Defense officials to members of the National Petroleum Council, pointing to the continuing need for industry-supported government assistance in the field of petroleum administration.

By J. E. BRANTLY

Assistant Deputy Administrator, Foreign Operations
Petroleum Administration for Defense

SINCE its establishment in October, 1950, the Petroleum Administration for Defense has had the responsibility of assuring an adequate supply of petroleum and its products, not just for the United States, but also for its free foreign allies.

This has been no simple task. Even in early 1951, when first the Foreign Branch of PAD was being set up, the situation abroad was troublesome. Foreign refineries and transportation facilities were operating at practical maximum capacity. Only crude oil production was comfortably adequate. The supply of products throughout the free world was in very delicate balance with essential requirements.

In order to assure continuance of that balance it was necessary that PAD have available to it complete information concerning the consumption of petroleum abroad and the operations of all branches of the foreign petroleum industry. This information could not be satisfactorily gathered by PAD or by any other government agency through existing channels. It could be obtained only from those companies operating throughout the free world that were using such statistics and estimates every day. Therefore it was necessary that these companies be encouraged to work with PAD and to participate in a mechanism under the close guidance of this governmental agency.

Discussions of these problems were first undertaken in December of 1950 and from time to time during early 1951. Then in April of 1951 the Iranian operations of the Anglo-Iranian Oil Company oil properties and refinery were interrupted briefly by a strike. There was a threatened loss of 660,000 barrels per day of crude oil production that could have resulted in a net loss of 150,000 barrels per day of crude and 460,000 barrels per day of refined products for export. Immediately, conversations about machinery and procedures for coordinated action to supply the friendly foreign nations with petroleum became more intensive. The shutdown of the Anglo-Iranian properties in May and June of 1951 further intensified these conversations.

The "Voluntary Agreement Relating to the Supply of Petroleum to Friendly Foreign Nations," which was effective June 25, 1951, was, then, the result of deliberations that had been under way for several months. It provided PAD with an effective means of discharging the duties for which it was organized, insofar as foreign operations were concerned, under the then-abnormal conditions.

This agreement provided means approved by the proper authorities of the government by which those American oil companies operating in foreign service could, through their joint efforts, as required by the government, ascertain data on stocks, operations, available supplies, and consumption estimates throughout the free world. Nineteen companies became members of the Foreign Petroleum Supply Committee under this Voluntary Agreement and functioned through nine subcommittees, all of which, together with the main committees, were under the direction and close observation of the Foreign Branch of PAD.

The agreement also provided for the organization of plans of action as means of solving emergency or critical problems of supply that PAD might request the committee to consider. Such an emergency was created by the Iranian shutdown.

Immediately after the Iranian shutdown a serious imbalance existed between the supply and the free world requirements of petroleum products. It was necessary, therefore, that immediate action be taken to assure that the friendly foreign nations, and particularly the military, would receive petroleum products of the proper specifications when, as and where required.

Plan of Action No. 1 was brought into being on July 26, 1951, specifically to deal with the shortage of products resulting from this Iranian shutdown. The purpose of this plan was to permit, under the direction and close supervision of a governmental agency, cooperation among foreign operating companies to let them so organize their schedules of production, refining, transportation and distribution that the essential requirements of the friendly foreign nations would be provided.

The results of these efforts were highly successful. It is impossible in this brief report to detail the activities. A number of meetings and schedules, duly recorded in the minutes and carried out in close working relationship between the 19 member companies, PAD and other govern-

▪ CONTINUED ON PAGE 300

# of PAD Outlined

'... that emergencies may be met ... provide petroleum products needed for security ... job not finished ...'

By ELMER E. BATZELL

Assistant Deputy Administrator and General Counsel
Petroleum Administration for Defense

Elmer E. Batzell

IN THREE weeks of campaign oratory the King James' version appears to have become an indispensable ingredient in public utterance. There is a text appropriate to present circumstances: "Whilst thy servant was busy about thy affairs, Behold, thy prisoner has disappeared."

To build the petroleum resources of the free world, and the means of making these resources promptly and immediately available, against the threat of open warfare is a trust of high responsibility—a responsibility born of the ideals which this nation holds sacred; a prisoner which must not be permitted to disappear or be overlooked in the business of other important affairs requiring attention.

It was to discharge this trust, to meet this responsibility, to guard this prisoner, that the industry was called upon and the Petroleum Administration was created. This council was asked to expand its charter so that it could cooperate with the government in the discharge of that trust.

The Petroleum Administration and the expanded responsibilities of this council came into being after the commencement of hostilities in Korea. These hostilities continue. There is little in the world situation today which bespeaks cessation of a threat of even greater hostilities.

There are a good many matters that have been successfully handled in the past year and a half. But the basic fact is that this nation and the petroleum industry are not yet equipped to provide against the staggering demands of an all out war. The basic responsibilities placed upon PAD and the council, and the trust which they willingly assumed, remain for full accomplishment.

So long as there is a defense program participated in by all industries, there will remain a need for participation by the petroleum industry in that program; and for a government agency staffed by petroleum experts who can assist in making certain that the necessary facilities — wells, pipe lines, refineries, tanks — required to effect petroleum supply are built and made ready against a war demand.

Even more than merely assuring the physical plant, there remains the need for a government-industry team which can move quickly and vigorously to assure adequate petroleum supply.

Mr. Henry H. Fowler, as defense production administrator, has pointed out that we are perhaps half way along the total mobilization program. There is no point in starting a 440-yard dash and quitting ten yards from the finish. It is important to do well the remaining portion of our job.

Much has been achieved in the expansion of physical facilities. But neither this achievement nor the remaining job could be successful without the framework of industry and interagency understandings and relationships which have been developed. These basic tools are indispensable to the success of a petroleum program. They must not be permitted to rust in idleness occasioned by misunderstanding, neglect or collateral attack. My emphasis here is on the relationship of PAD to other agencies; but the relationship between industry and PAD is no less important to the successful discharge of the responsibilities we have assumed.

This agency has been fortunate perhaps in enjoying a greater degree of power and a greater latitude in the exercise of that power than have most defense agencies. These powers, however, do not exist separately and independently, but only in cooperation with other defense agencies. So long as these other agencies continue in existence to meet a defense need, there remains a need for a Petroleum Administration competent to assure the most appropriate distribution of materials and products in the interests of the defense program.

When PAD wants steel to do a defense job it must compete with every other agency that wants steel to do its defense job. While PAD has the power and authority to distribute the materials it gets in the best possible manner within the petroleum industry, it does not posses any right to an unlimited quantity of materials to accomplish its needs. It must fight—and fight vigorously—before the Defense Production Administration justifying petroleum on the basis of its relative essentiality to the defense program. It must withstand the com-

petitive attack of every other seeker for material.

Once having gotten its mete, PAD must distribute to the best interests of the defense program. But the mechanisms for distribution cannot be completely separate from the mechanisms generally applicable to all industry, for otherwise it would be impossible for the suppliers of steel, copper, heat exchangers, compressors, blowers and the like to know the priorities rules under which distribution must be made.

Accordingly, any PAD materials distribution program must, at the least, be within the framework and use the same symbols and concepts as the general materials distribution systems established by the National Production Authority.

Financial Assistance

To be sure, most general distribution systems do not fit the peculiar problems of the petroleum industry. It is for this reason that PAD has developed an M-46, an M-46A and an M-46B order. But while these orders are calculated to adapt the NPA system to the petroleum industry, the orders do not and cannot operate independently of the general principles of the materials distribution program.

PAD is the petroleum expert not only in matters of material claims and distribution but also in matters relating to financial aids required to assist in assuring adequate defense supplies of petroleum and its products. Its authority for final action in this area is, however, less than in the case of materials.

In the matter of Necessity Certificates for accelerated amortization, PAD must establish its special rules for particular cases within the framework of the general policies established by the Defense Production Administration. When loans are made, DPA standards as to defense necessity must be utilized for analysis; while as to financial soundness, the analysis, and the loan itself, must be made by the Reconstruction Finance Corporation.

In matters of price, the Petroleum Administration has no direct concern except (a) as it may be called upon by the Office of Price Stabilization to render expert analysis and advice or (b) as it may positively request of OPS price reconsideration or adjustment because the price structure as established constitutes a direct, immediate and far-reaching barrier to the supply of petroleum and its products for defense objectives.

Although the Petroleum Administration relationship to the price agency may in general be considered casual, it has on three occasions of vital concern to the defense program —Avgas, Navy Special and East Coast heating oil—been a somewhat more intimate one (if I can thus describe it); and in each of these instances the intimacy was necessitated by the conclusive fact that the price structure as existing or proposed raised an insurmountable barrier to the achievement of PAD's supply responsibilities.

Military Role

Where government contracts have been required in aiding the development of such direct defense products as alkylate, the military authorities rather than PAD have negotiated not only the final agreements but have established the basic minimum conditions. On the other hand, the appropriateness of the price both in such contracts and in negotiated aviation gasoline arrangements approved by OPS has been a matter determined by PAD certification. Loan necessity certificate and material applications for strategic storage to be built under contracts entered into independently by the Defense Department are processed by PAD.

Where shortages exist in petroleum products, PAD is responsible for not only making available maximum supplies to meet defense obligations but also deciding, subject to final review by the Defense Production administrator, among competing requirements. PAD must lean upon other agencies such as the military, the Defense Production Administration, the Defense Transport Administration, the National Production Authority, the Department of Agriculture, the Civil Aeronautics Board, the Department of State, the Mutual Security Agency and the Office of International Trade for information and advice as to the relative demands as well as their relative urgency. A failure by PAD to meet its responsibilities, such as those arising as a result of the recent strike, would, under existing authorities and responsibilities, result only in their eager discharge by some other group. PAD's responsibilities are inextricably linked with other agencies engaged in the defense program.

PAD's responsibilities are also broader area-wise than are the responsibilities of many defense agencies. Under Executive Order 10161, PAD has a world-wide responsibility for the adequate supply of petroleum and its products. This necessarily poses a different and more complex problem from that posed to many other agencies. It is this broader obligation which has made necessary such collateral agreements as the Foreign Voluntary Agreement, Plan of Action No. 1, the Foreign Petroleum Committee and the Foreign Petroleum Materials Committee.

In undertaking its basic responsibility, the Petroleum Administration has assumed a number of subordinate obligations. Among these are:

- To regulate by order and directive no more than is absolutely necessary.
- To continue regulation no longer than is absolutely necessary.
- To disturb competitive relationships as little as possible.
- To rely to the maximum extent upon industry know-how in the accomplishment of objectives.
- To establish a government-industry understanding which will maximize the benefits of private initiative while assuring full recognition of the public interest.
- To terminate the agency as quickly as the basic trust is satisfactorily discharged.

In fulfilling these obligations, as in discharging its basic trust, PAD must operate with the tools of industry understanding and interagency cooperation.

Objective Obscured

There are many factors, differing at different times, which obscure the main objective: political campaigns, jurisdictional battles, congressional inquiries, investigations, conflicting views as to government control and industry freedom. These are part of the problem of government. But such distracting influences, important as they may be, do not relieve either PAD or the industry of the basic trust —preparing this nation against the possibility of open war.

The basic job which we have undertaken is not yet finished. It will require the wholehearted effort and cooperation of all to assure its completion. That cooperation must be both between industry and government and among the several government agencies themselves. The framework of industry and interagency relationships erected to do the job must not be permitted to be destroyed until the job is done. Then and then only should they disappear.

The distracting influences which would permit the prisoner to disappear must be subordinate to the job that remains to be done. It is important now as never before in this defense program to keep our eyes on the ball.

Here's how a typical **two-stage** cementing job is performed with the **Baker** Stage Cementing Collar

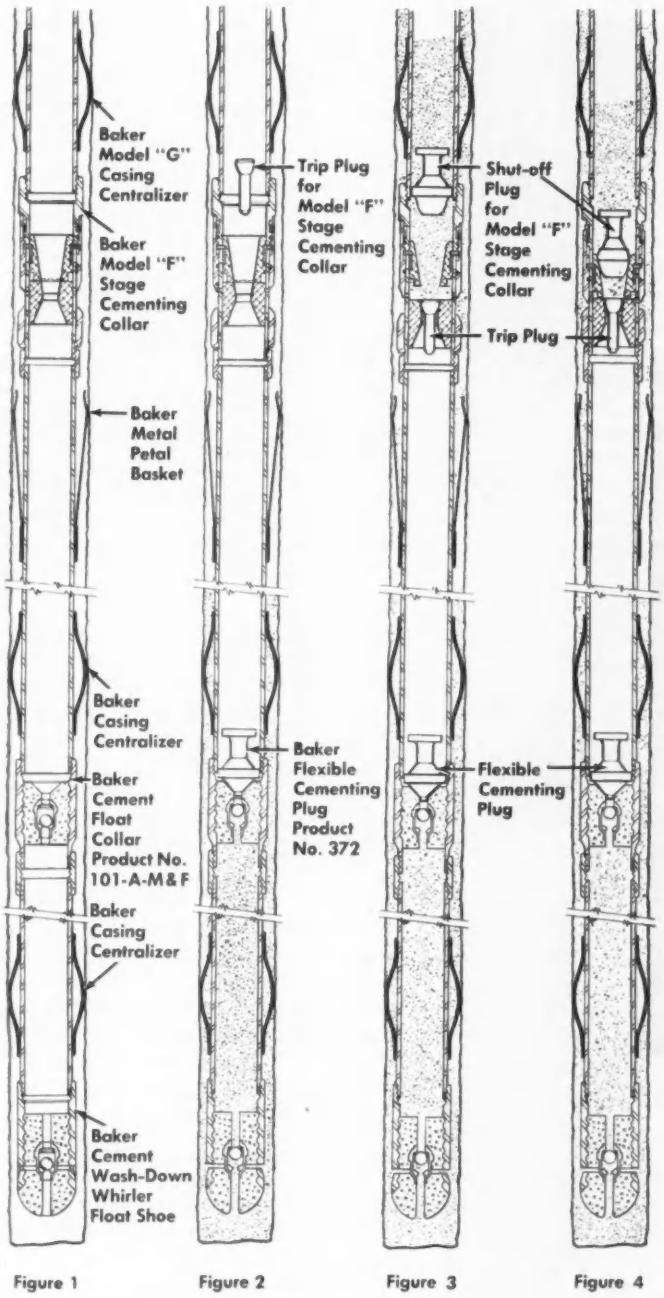
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Figure 1 Figure 2 Figure 3 Figure 4

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Fig. 1—Hook-Up in Running-In and Mud-Conditioning Position. The string (starting at bottom) consists of a Baker Cement Wash-Down Whirler Float Shoe for conditioning the hole, washing away bridges, and cementation of the lower (first) stage. Baker Casing Centralizers are positioned at strategic points (as illustrated) to center the casing, ensure annular clearance, and avoid channeling of the cement slurry. Next above is a Baker Cement Float Collar with Seat for Flexible Plug, Product No. 101-A M.&F. A Baker Metal Petal Basket (optional equipment) is positioned just below the Stage Cementing Collar to retain all cement slurry *above* the Basket when the second-stage cementation is performed. Note that Baker Casing Centralizers are used just above the Stage Cementing Collar to ensure annular clearance for the upward movement of the cement slurry.

Fig. 2—The first-stage cement job has been completed. The Flexible Plug has been pumped through the Stage Collar to its seat in the bevelled top of the Float Collar where it prevents over-pumping and also separates the cement slurry from the follow-up fluid. The Trip Plug has been placed in the casing and is gravitating to its seat in the Lower Inner Sleeve of the Stage Collar; see also Fig. B on opposite page. Application of hydraulic pressure, after the Trip Plug is seated, will result in opening of the cementing ports.

Fig. 3—The second-stage cement job is almost completed. The cement slurry has passed through the open ports, and the Shut-Off Plug (acting as a separator) is approaching its seat in the Upper Inner Sleeve of the Stage Collar. Note how the Baker Metal Petal Basket has prevented downward movement of the cement.

Fig. 4—Both stages have now been successfully cemented. The cementing ports are closed off by the Shut-Off Sleeve which is locked in position as shown in Fig. C on opposite page. When the cement has set, the readily drillable internal mechanism of the Baker Stage Cementing Collar, Float Collar and Float Shoe are removed by the drilling bit leaving the full I.D. of the casing free from any sharp shoulders or other obstructions, ready for all subsequent operations.

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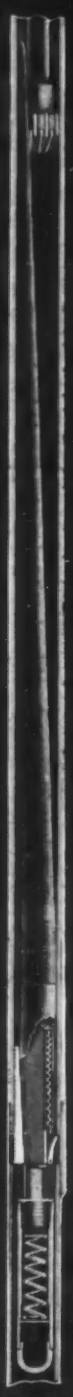

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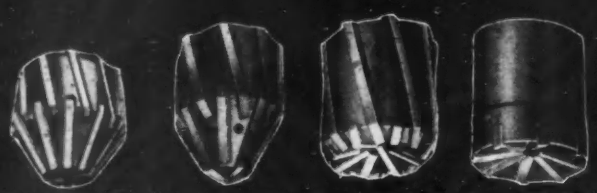

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• CONTINUED FROM PAGE 294

ment agencies, provided the basic means for meeting the supply crisis. Although the requirements of friendly foreign nations outside the United States increased approximately 320,000 barrels per day over the average for the preceding years, all those requirements—military and civilian—were met almost as they would have been had there been no Iranian shutdown.

This accomplishment would not have been possible without the provisions for inter-company action written into the Voluntary Agreement and its Plan of Action No. 1 and the work of the member companies within those provisions.

The world-wide critical conditions that existed when PAD was organized in late 1950 are still with us. The defense effort of our nation and certain of the nations friendly to us continue. Supply of petroleum products is in delicate balance with free-world requirements. The consumption of petroleum products for both civilian and military use is increasing at a greater than anticipated rate throughout the world. The present delicate balance will doubtless continue for two years or more. Critical emergencies may develop at any time.

In order that present day-to-day operations may be carried on and that emergencies may be met if, when, and as they occur, in order that our own nation and the friendly foreign nations may receive the petroleum products essential to their security, it is necessary that there be a vehicle through which the required information can be gathered, assimilated and tabulated in useful form for the guidance of PAD and the agencies associated with it in the defense program. It is further necessary that there be a vehicle in existence that will permit the prompt institution of other plans of action approved by proper authorities should the need arise.

The Voluntary Agreement provides for both of these requirements. The continuance of information-gathering activities under it, under the direction and observation of PAD, is an essential part of the defense effort of our nation and of the friendly foreign nations. Under its provisions the necessary action can be taken through the coordinated efforts of the American-owned foreign operating companies of the oil industry to meet such critical conditions as may arise. The cooperation of domestic companies of the oil industry and allied industries is likewise necessary.

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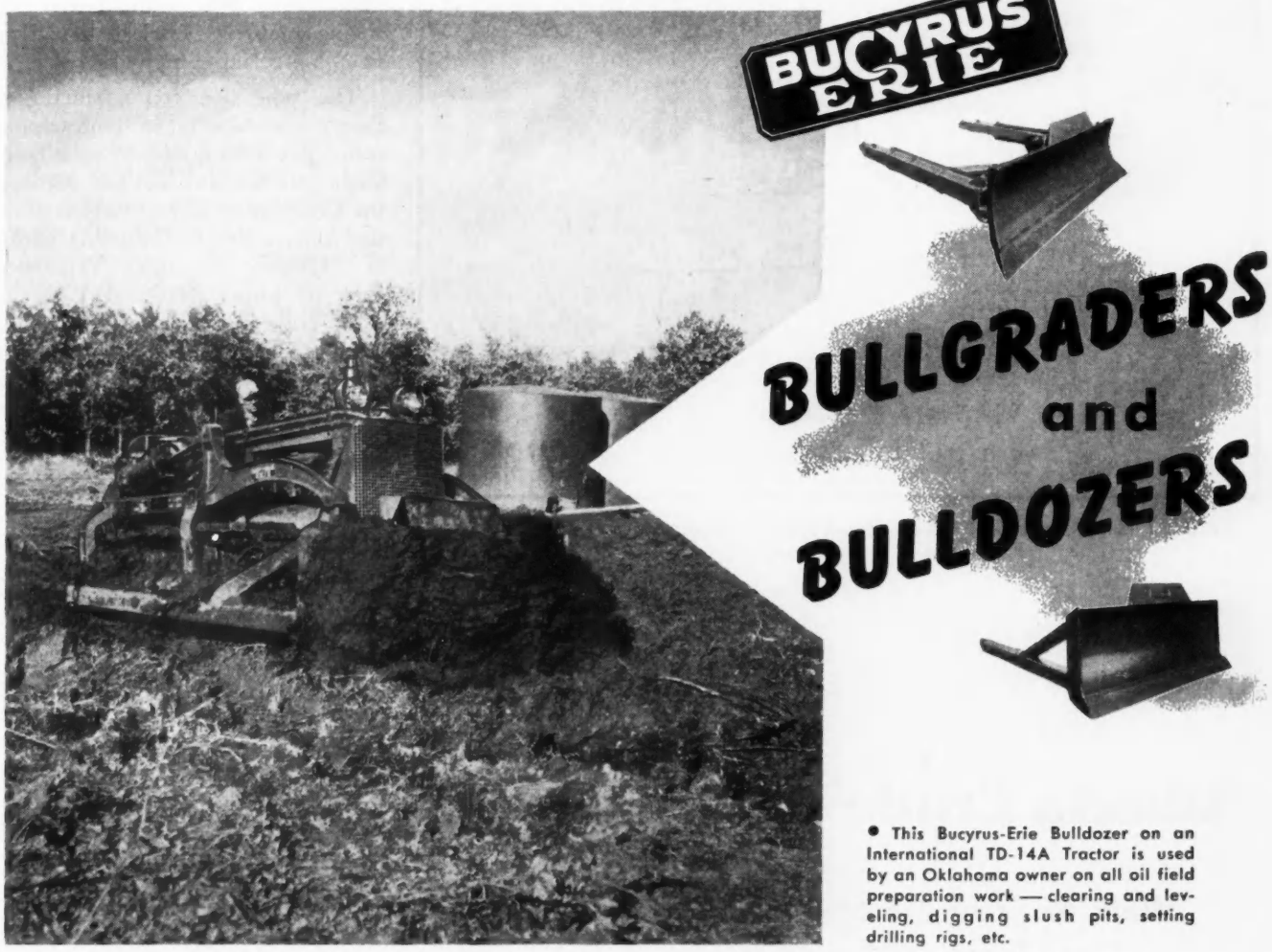

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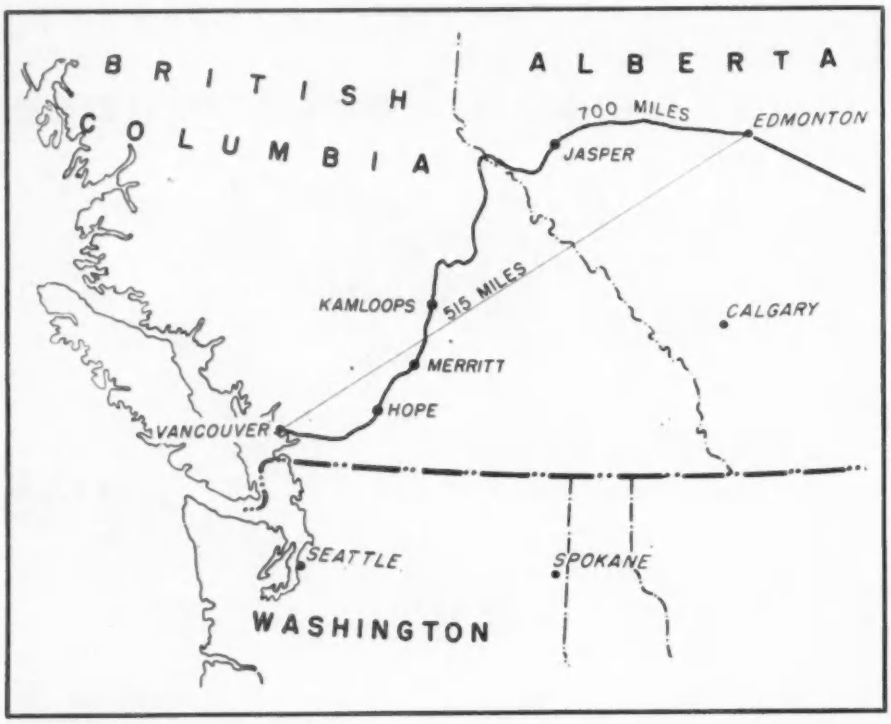

FIGURE 1. Map shows route of Trans Mountain Oil Pipe Line Company line from Edmonton, Alberta, to Vancouver, B. C.

Alberta Crude to Head West

Work on Trans Mountain Line in Full Swing; Three Pump Stations Will Allow Initial Flow of 120,000 Barrels Daily

By GILBERT M. WILSON
WORLD OIL Staff

CONSTRUCTION will begin this year on three pump stations instead of the two originally planned for initial operation of Trans Mountain Oil Pipe Line Company's 24-inch, 120,000-barrel-a-day crude line from the Edmonton, Alberta, area to refineries in the Vancouver section of British Columbia.

Right-of-way clearing and pipelaying operations are under way on the all-Canadian line (Figure 1), approved last year by the Canadian Board of Transport Commissioners. Canadian Bechtel Limited is designing and constructing the 712-mile line, which is backed by six major oil companies and 14 independent Alberta producers.

Contracts for laying of pipe have been let to two companies. Comstock Midwestern Limited, of Toronto, which will handle about two-thirds of the work on the eastern and western ends of the route; and Mannix, Ltd., of Calgary, which will build about a third of the center section.

Route of the pipe line, one of several studied, traverses some of the toughest pipelining terrain in North America. Mapping of several alternate routes and the finally-selected right-of-way, has been in progress since late 1950 by Canadian Bechtel engineers. Survey work included considerable aerial mapping.

The pipe line route, starting at Edmonton, Alberta, in gently rolling country, climbs gradually as it enters Canadian Rockies foothills. Crossing the Continental Divide, which also is the Alberta-British Columbia border, at 3720-foot elevation Yellowhead Pass in Jasper National Park, the route traverses timber country as it skirts the base of Mt. Robson (elevation 12,972 feet), highest point in the Canadian Rockies. The route then turns in a southwesterly direction toward Vancouver.

About 75 miles beyond Yellowhead Pass the route crosses the Monashee Mountain Range at Albreda, B. C., at elevation of 2666 feet. It then approaches the upper end of the North Thompson River, and follows its course on down to Kamloops, where the terrain opens out into sagebrush cattle country.

Across Plateau

Continuing in a southwesterly direction, the route crosses a 4000-foot elevation plateau to the town of Merritt, then enters the rugged Coquihalla Canyon region. After crossing the Coast Range at an elevation of 3660 feet, the route drops rapidly to the town of Hope on the Fraser River, a point some 90 miles east of Vancouver. From this point the route continues in a westerly direction, following the course of the Fraser River through farming country to the Vancouver area. The profile chart (Figure 2) shows the extremely rugged nature of the terrain.

With three pump stations initially at Edmonton and Marlboro, in Alberta, and Kamloops, B. C., additional stations to be added later will raise the line's capacity to more than 200,000 barrels daily. Probable sites of these additional stations are Peers, Alberta, about 115 miles west of Edmonton; Jasper, Alberta, near Yellowhead Pass; and Black Pool, B. C., on the North Thompson River about 65 miles north of Kamloops station. Pumps will be diesel-engine driven.

Discharge pressures of the Edmonton pump station will be 910 pounds per square inch and at Kamloops station 570 psi. Average gravity of

the crude to be shipped will be 36 degrees.

Pipe laying in western Alberta and in most sections of British Columbia probably will be limited to about five or six months of the year, during summer and fall seasons, since most wrapping and laying operations require relatively dry conditions and moderate temperatures. Work will be done by four spreads: one working eastward out of Vancouver; two operating out of Red Pass, B. C. (about 30 miles west of the Continental Divide), and one operating in the vicinity of Kamloops.

Approximately 1500 men will be employed in clearing the rocky and forested right-of-way and in pipe line construction work. Four pipe-laying crews will work during the 1952 construction season and five crews in 1953.

The pipe line ditch will be 44 inches wide and will have a 30- to 36-inch cover over the line. The 24-inch pipe will be given a coal tar coating, then will be covered with a glass mat inner wrap and a 15-pound asbestos outer wrap. Less than 10 percent of the right-of-way is expected to require explosives in ditching operations. Generally, underwater crossings will be made at mountain streams and rivers.

Work Progressing

Work is progressing rapidly, with timber clearing operations receiving a high priority in order to complete slash burning before the fire hazard of the dry season brings on government closure of forests in the provinces.

The approximately 150,000 tons of pipe required for the job will be unloaded at available sidings along the railroad to reduce truck hauling in the rough terrain along the right-of-way.

The line is expected to be operating on or before December 31, 1953. Operation and maintenance of the line will require about 200 permanent personnel.

Strong industrial support on both sides of the border has been given this project. The company has been organized with an authorized capitalization of 5 million common shares; approximately 1.5 million of them issued initially. Canadian and U. S. companies and the public are participating. Six major oil companies have taken 670,000 shares; the 14 independent Alberta producers, a total of 250,000 shares; and the Bechtel interests, sponsors of the line,

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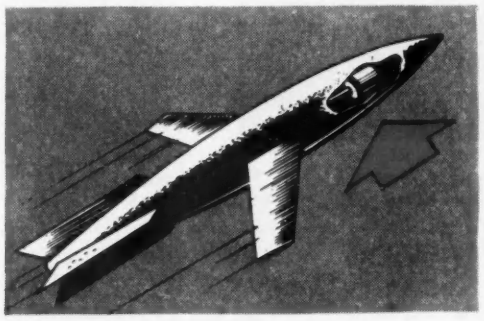
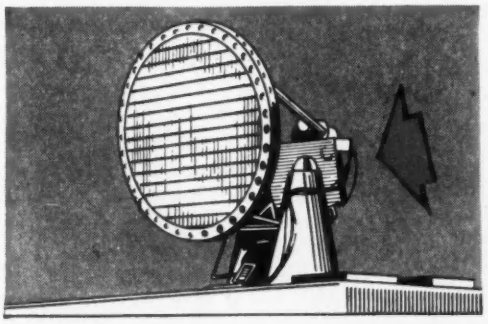


A delicate "brain" in the nose of a guided missile . . .



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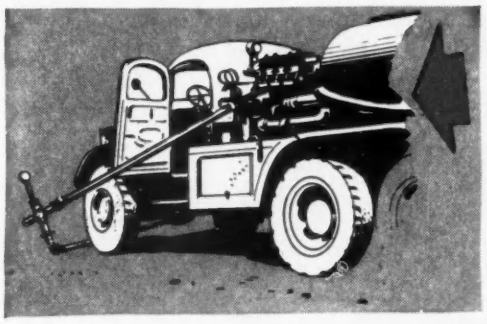

A ¼ ton pump housing . . .

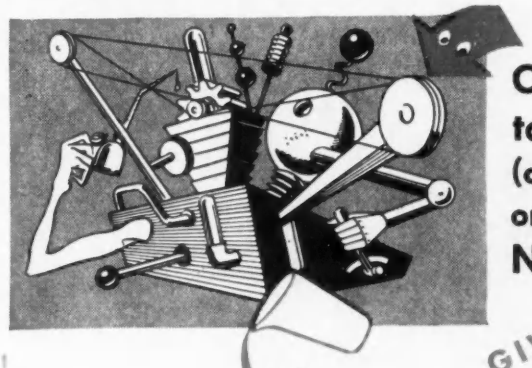

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FIGURE 2 (left). Reconnaisance party surveys right-of-way along North Thompson River in British Columbia. Note Canadian National Railways line paralleling river. Rail shipping of pipe and heavy equipment will reduce truck hauling in difficult terrain.

FIGURE 3 (right). Power rail cars assist in transporting right-of-way survey parties in the headwaters region of Coquihalla River, one or more rocky portions of route followed by Trans Mountain line.

130,000 shares. In addition, 450,000 shares were offered to the Canadian public.

Participation of the six major oil companies was as follows: Imperial Oil, Limited; Canadian Gulf Oil Company; Shell Oil Company of Canada, Limited; and Standard Oil Company of British Columbia, Limited each took 130,000 shares. Union Oil Company of California took 100,000 shares and Richfield Oil Corporation took 50,000 shares.

Officers of the new line include S. D. Bechtel, chairman of the board; Robert L. Bridges, president; and Sidney M. Blair, vice president. Canadian Bechtel Limited is acting as agent for Trans Mountain Oil Pipe Line Company. Canadian Bechtel Limited, of which Van W. Rosendahl is president, will plan, engineer, supervise and construct the line, pump stations and terminals. In addition, the management and supervision of the company will be supplied initially by Canadian Bechtel Limited, with the assistance of the major oil companies participating. Canadian Bechtel Limited is a subsidiary of Bechtel Corporation.

Other key personnel assigned to the project include D. L. Roberts, a vice president of Canadian Bechtel Limited, who is serving as project manager; Ralph Hamilton, engineering manager; C. E. Barker, construction manager; W. C. Ralston, administrative manager; J. D. Creveling, lands manager; and J. H. Burroughs, general superintendent, pipe lines. H. H. Hall and Ray L. Hamilton are consultants.

Project headquarters for Canadian Bechtel Limited are at Vancouver, B. C.

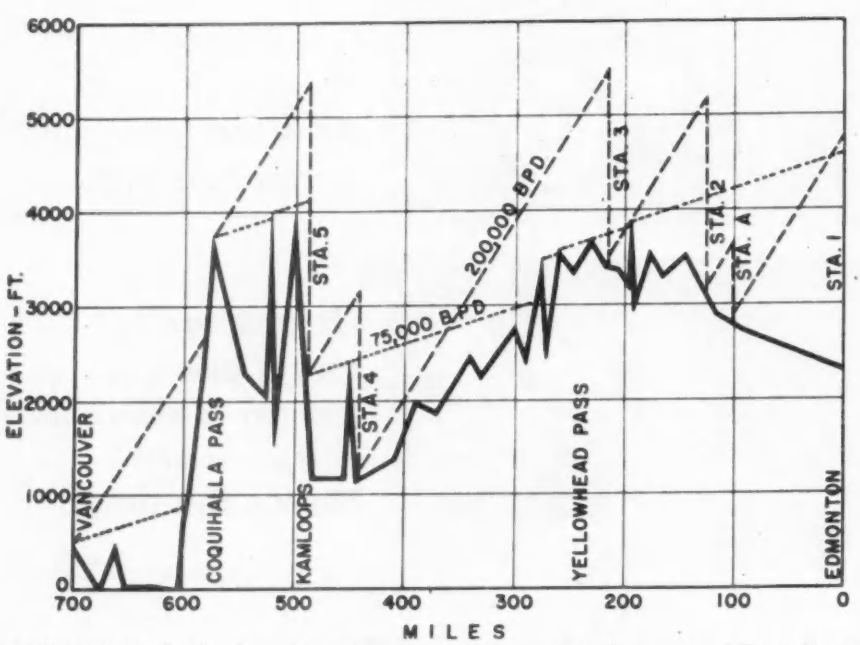
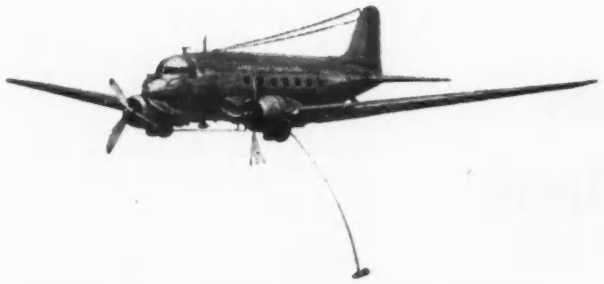


FIGURE 4 (left). Profile chart shows elevations at various points along route of Trans Mountain pipe line. Sites of pump stations to be installed initially or in future also located. Ground and aerial surveys were used in selecting best route.

FIGURE 5 (right). On the job when clearing operations started near Vavenby, B. C. were: seated at top, Jack H. Burroughs, general superintendent, Canadian Bechtel Limited; below left to right, M. T. Wilhite, general superintendent, Comstock Midwestern, Ltd.; Cal Baker, project manager, Mannix, Ltd., and C. E. Barker, construction manager, Canadian Bechtel Limited. Vavenby is on North Thompson River north of Kamloops.



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Solution of Iran Crisis Could Present a Problem

SHOULD the expediency of "solving" the Iranian crisis by diplomatic circles in London and Washington to prevent a possible Communist coup of the Middle East nation and its vast oil resources ignore the basic legal question of outright abrogation of contract, then oil companies operating around the world may be in for a new squeeze to force abnormal demands by nationalistic groups or face loss of concessions.

In the nearly 18 months since the "nationalization" of Iran's oil and the expulsion of Anglo-Iranian Oil Company from the nation, the complete failure of the Iranian management of its oil resources has been the important factor in preventing similar confiscatory moves in several other areas. Unsuccessful through economic means of bringing Anglo-Iranian or the British Government to agree to a settlement "within the framework of the nationalization law," Premier Mossadegh, since his comeback late in July, has turned the possible settlement of the issues involved to a last resort political measure.

In effect, Mossadegh's new offer of a settlement to the British Government controlled company carries the threat that if some early economic salvation is not forthcoming for Iran, the nation may be grabbed by the Moscow-directed Tudeh Party. The possibility for such an occurrence, according to qualified observers, is definitely real. Mossadegh's position throughout the dispute has been for a forced settlement, and, though failing at the economic level due to the success of Anglo-Iranian in increasing its production and refinery throughput elsewhere, he may have greater success at prodding the Western world into an Iranian-dictated settlement in its vulnerable desire to stop world Communism.

Any form of economic aid, whether it be the extreme of granting Iranian demands that it be allowed to commence full operation of the producing and refinery properties built by AIOC and to sell petroleum abroad or a temporary cash handout from Washington, would enhance the Iranian position that the Western nations (and the oil-producing companies) had been forced to come to terms.

In this event, nationalistic groups in major oil-producing nations where the government is the sole suboil owner would be immediately encouraged to force unreasonable terms.

At the other extreme, a return of Iranian oil in volume to world markets, whether under Anglo-Iranian Oil Company ownership or through the Iranian Government operation, undoubtedly would mean some reductions in output elsewhere in the Middle East and possibly bringing new demands for monetary concessions as royalty payments decline with lower production.

The rise, fall and comeback of Mossadegh proved Anglo-Iranian was correct in telling the Iranians at the outset of the "nationalization" action that the move would mean bankruptcy. It also proved Mossadegh and the Nationalists leaders possessed the only effective control in Iran. The financial crisis forced the resignation of Mossadegh, but, aided by the Tudeh Party, it brought him back with greater power than ever.

While his tenure of office may be subject to sudden end as it was in July, the fact has been clearly indicated that the majority of Iranians of political influence still support the principle of "nationalized" oil.

The basic stumbling block to a lasting settlement of the legal issues involved in the dispute is the Iranian Government's insistence that any new agreement can be made only after recognition is given to Iranian ownership of the present oil installations. And in late August it was uncertain whether abrogation of a contract would be pushed into the background and political expediency to bow to the Iranian's rule in the settlement of the basic issues.

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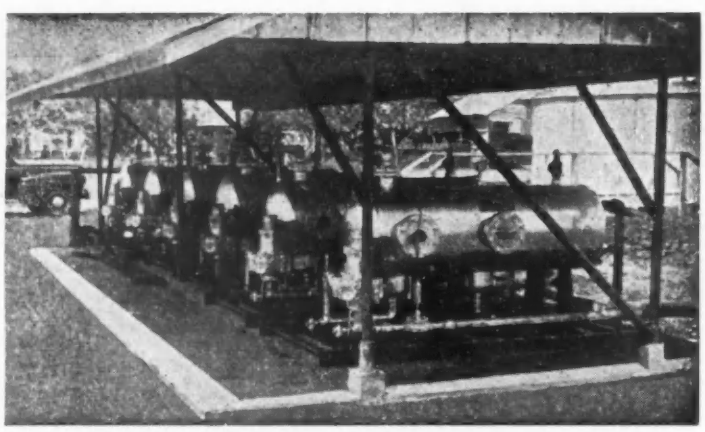

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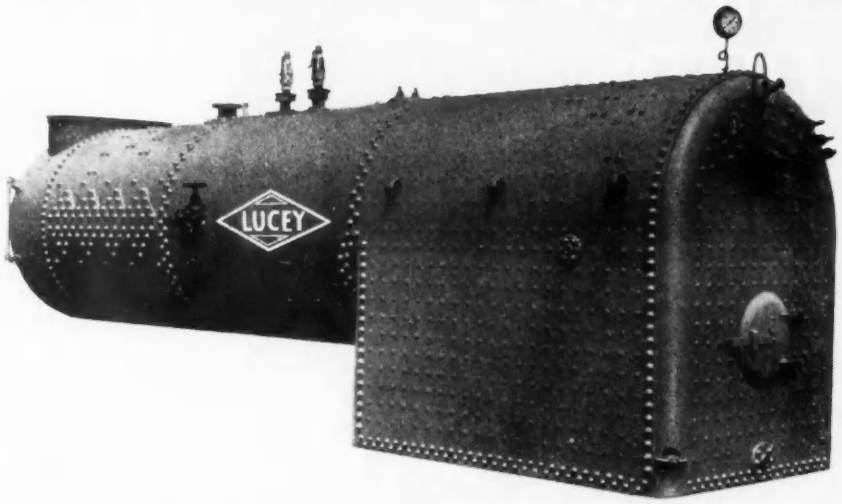

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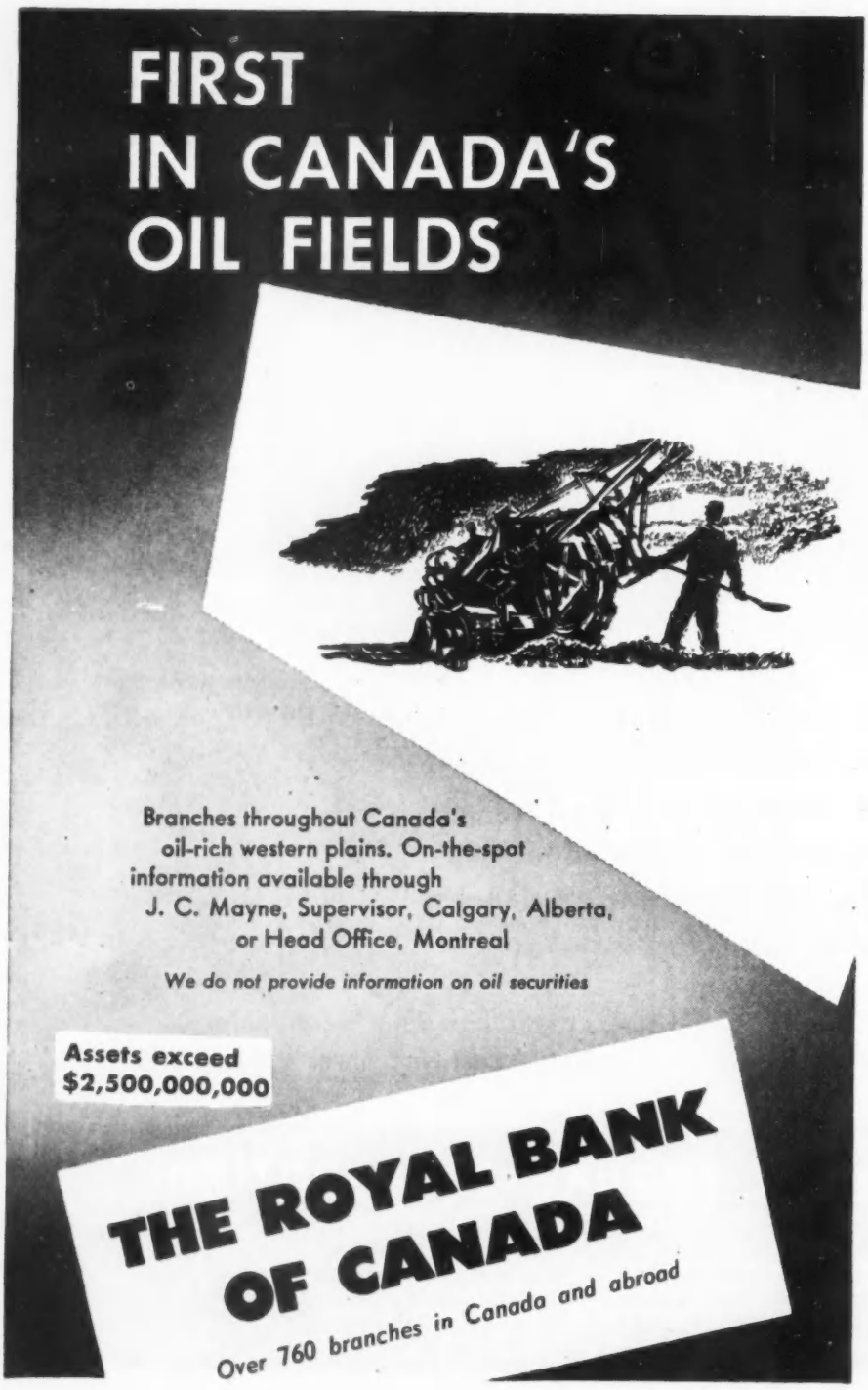
New Aid Program to Help Industry in Yugoslavia

Concentrating on raw material deliveries to Yugoslavian industries, the new tripartite aid program has been set up for the fiscal year of 1952-53. In addition to other materials, Yugoslavia will receive almost 3.5 million barrels of "raw gasoline" and an unspecified amount of crude.

Almost $150 million was sanctioned for aid to Yugoslavia last year. Of that amount 65 percent was furnished by the U.S., 23 percent by Britain and 12 percent by France.

Imported crude and "raw gasoline" will be processed in Yugoslav refineries to bolster the nation's economy. Refined products will be exported to Western Germany, Italy and Austria.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New Wet Gas Field Indicated in Canada

Another substantial wet gas and distillate field has been indicated near Calgary, Alberta, with the initial success of the first well being drilled on Britalta Petroleums Limited's Winchell Coulee Reservation.

Delhi-Britalta-Winchell Coulee 1, which is being drilled under a farmout agreement by Canadian Delhi Oil Ltd., tested the Cardium formation at 5236 feet to 5246 feet and found at least 10 Mmcf. of wet gas. During the testing interval, the well sprayed clear distillate. When pipe was pulled, it contained 130 feet of distillate. Closed pressure was 2500 psi and flowing pressure 1350 psi. Coring is proceeding to determine the producing zone's limits.

Under its agreement with Britalta, Canadian Delhi has the right to take production prior to depths of 10,000 feet, but that company does not earn an interest in the well or the properties until it has completed a test well to 10,000 feet, unless commercial oil is found at a lesser depth.

Delhi probably will elect to complete the well in the Cardium and proceed to drill the required 10,000 feet to the underlying Madison limestone formation on another location.

This possible new field may be of the same type as Gulf Oil Company's famed Pincher Creek field which lies in the same strike but farther south.

Two German Pipe Lines Are Under Construction

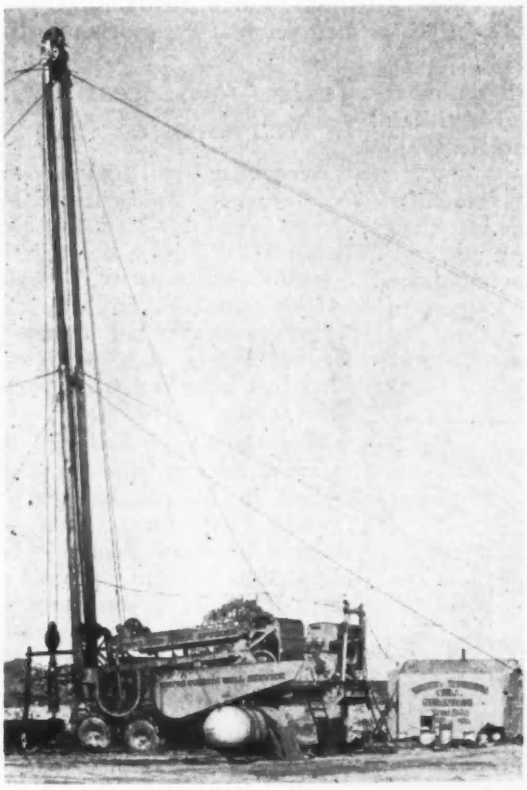
In addition to the new pipe line from the German harbor of Duisburg-Ruhrort to the Ruhrchemie AG, refinery at Oberhausen-Holten, a 20-mile pipe line is under construction between Ruhrort to Scholven-Chemie AG refinery at Gelsenkirchen-Buer. A 22-mile long branch line will be laid to the Gelsenberg-Benzin plant at Horst.

Eight-inch pipe will be used for the line between Ruhrort to the Scholven-Chemie plant, and the annual capacity will reach 7 million barrels. Completion date has been set for October 1.

Big Tank Moved Fast

The Csepel Mineral Oil Industries National Undertaking of Hungary has moved a 243-ton, 50,000-barrel crude storage tank 172 feet in four days. The moving of the completely-assembled tank was originally expected to require four months.

Today's 6 Biggest Spudder Features



Wayne Roberts, owner of Wayne Roberts Well Service, Healdton, Oklahoma, owns 3 Walker-Neer Spudders, including the Model S-33 pictured here. "Walker-Neer Spudders," says Wayne Roberts, "are the smoothest, quietest, most efficient spudders in the field."

1. Walker-Neer's "Tor-Shock" (Rubber Torsion) Shock Absorber provides the smoothest, quietest drilling motion ever known, thus relieving stress and strain throughout the machine—and gives the tools extra snap, for a faster, more efficient spudding action.

2. Walker-Neer's Chain and V-Belt Drive offers greater power and strength for hoisting greater loads out of the hole at top speed, and brings bad-weather efficiency to a new high.

3. Traveling spudding sheaves and heel sheaves attached to the spudding beams assure free spooling with Walker-Neer Spudders.

4. All drums and mast-head sheaves on Walker-Neer Spudders are mounted on ball or roller bearings. No stoppages for lubrication.

5. Hydraulic Brakes, optional on Walker-Neer Spudders, prevent excessive brake band wear and brake ring heating, practically eliminate brake lining replacement, and doubly assure safety.

6. Walker-Neer provides an independent clutch for each drive, including catheads; thus, no part sustains wear needlessly. Walker-Neer's arrangement of all controls at one operator's platform is unmatched for efficiency.

Explain

WALKER-NEER LEADERSHIP

In Spudder Design

WALKER-NEER MACHINE COMPANY, WICHITA FALLS, TEXAS

Field Production Boosts In Hungary Are Explained

Leading Hungarian stakhanovite worker (speed worker), Joszef Kiss of Lovaszi field's well 9, in explaining how field production boosts were achieved, said, "We drill 5000 feet in 18 to 19 days while we used to take 38 to 40 days before the new working methods were introduced."

"The former methods of drilling were abolished when we took over Soviet experiences in drilling, and now we put a bigger load on the bit. Experiences of the Soviets led us to take care of the cutting edge of the bit. Today, we never wait until the edge of the bit gets worn completely, but we change the cutter head much sooner."

Kiss reported that while RPMs of 60 to 65 were usual heretofore, the average has been raised to 80 or 85, and in most favorable conditions even to 90 and 95.

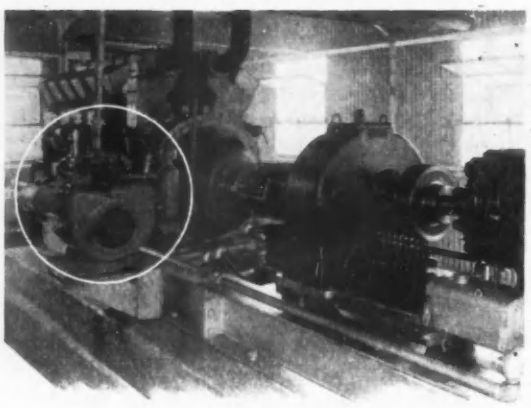
In raising the output of the Hungarian fields, Kiss attributed much of the success to thorough inspection of rig and equipment by each shift.

"We don't even use drill pipes with a little damage on the thread ends," he said.

Thirty Polish Drillers Given Diplomas After Schooling

Thirty new Polish oil drilling specialists have received diplomas after completing a two-year course in drilling at the government-sponsored school in Gorlice, Galicia.

These experts will disseminate Soviet drilling practices among their co-workers, emphasizing the increased electrification of equipment. Plans for 1952 include a 33 percent rise in drilling and 36 percent increase in crude production.



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Creole Publishes Prices On Venezuelan Crude

Creole Petroleum Corporation has begun publishing prices at which it will buy and sell Venezuelan crude f.o.b. Venezuelan deep water terminals.

Reason for this decision, said Creole President Arthur T. Proudfit, is that "the United States of Venezuela is the largest petroleum exporting nation in the world, a position formerly held by the United States of North America. Venezuela is also the second largest petroleum producing country."

"In view of Venezuela's position in the petroleum industry," he said, "there should be published prices for petroleum at Venezuelan ports."

Tests Are Successful In Neumuenster Area

Successful production tests have been reported by Deutsche Vacuum Oel AG. (Socony-Vacuum)-Deutsche Erdol-AG.-Preussag Boostedt 1 about 5½ miles southeast of Neumuenster, Middle Holstein. In May the well found promising oil traces in the Lower Dogger at a depth of 5641-5792 feet after penetrating a 33-foot sand layer.

The German discovery has occasioned interest since previous wells drilled in Middle Holstein proved failures. Heretofore, it was generally thought that in Schleswig-Holstein oil deposits were to be found only at the salt trends of the western coast. Boostedt 1 will cause renewed interest in Schleswig-Holstein subsoil exploration.

Oil Traces Found in Turkey

North and northeast of Ramandag, Turkey's one oil field, deep wells were drilled on the Garzan and Kentalan structures. Both tests found oil traces.

Armena, Glen Park Sites Set

Drilling is scheduled to begin on both the Armena and Glen Park sections purchased at the recent Alberta crown reserve auction by the British American Oil Company, Ltd. The Armena section is surrounded completely by producing wells. The Glen Park area is offset to the north, west and southwest by production.

Yugoslavia Gets Assistance

U. S. experts have arrived in Yugoslavia to modernize the oil industry under the auspices of the United Nations.

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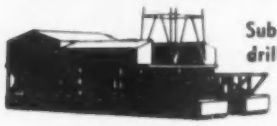
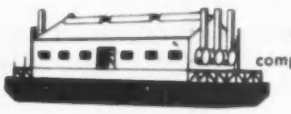


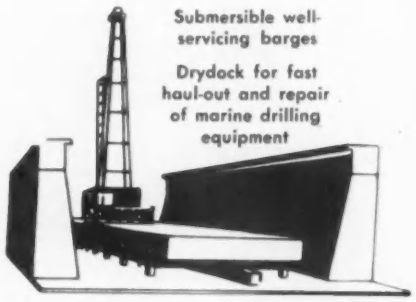
Submersible drilling barges

Tugs



Boiler and compressor barges

Water, oil, and supply barges



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Pakistan Oil Discovery Called Encouraging

Attock Oil Company's oil strike at Dhulian, Pakistan, has been called "most encouraging." As a result of geological information obtained from deep drilling at the company's Balkassar field, it was decided about a year ago to deepen at a well at Dhulian.

Oil was struck at 8260 feet, almost 600 feet below the former oil-producing horizon. But the oil was accompanied by considerable water, and engineers were unable to determine whether the strike was water-free since the hole had passed through water-bearing strata.

When another well, 750 feet away, was deepened and casing cemented above the new horizon, water-free oil was produced. A third well, almost a mile distant, now is being prepared for deepening to test the extent of the oil-bearing strata.

Shell Subsidiary Abandons Exploration in Australia

Shell (Queensland) Development. the last major international company actively seeking oil in Australia, has announced intentions of abandoning the quest.

Some surveying work is being continued in Australia by local companies and the commonwealth and state governments. It was recently announced Bureau of Mineral Resources are beginning an aerial magnetometer survey of the Lakes Entrance district of Victoria.

Germany Oil Yield Increases in April

According to preliminary reports. German oil fields yielded a total of 989,366 barrels of crude in April, as compared with 984,292 barrels in March. The daily average output rose from 31,752 barrels to 32,982 barrels.

Emsland, the oil district between the Weser and Ems rivers, and the Hanover area had an equal share in the yield. For the first time, Suderbruch (Hanover area) produced more than 91,871 barrels, Hohne 35,335 barrels and Scheerhorn (Emsland) 28,268 barrels. Georgsdorf field led April production with a yield of 97,412 barrels.

Pipe Line Capacity To Rise

Capacity of the Vado Ligure-San Martino di Trecate pipe line will be increased from 7,347,300 barrels annually to 9,280,000 barrels with the installation of a second pump station.

Pasta Partnership

Everybody wins in this international exchange. Italian students will get some first-hand knowledge of how to find oil—which their country now has only in trickles and driblets—and an American will have the chance to learn more about a world neighbor and the names of 36 varieties of spaghetti.

The University of Cagliari, Italy, is looking for a U. S. geologist to teach specialized courses in oil exploration. The job is offered through the Fulbright program, and full details are available from the Committee on International Exchange of Persons, 2101 Constitution Avenue, Washington 25, D. C.

Germany Gas Yield May Set New Record

If Germany maintains its natural gas production at the rate achieved in the first quarter of this year, annual yield for the year will amount to about 3.5 billion cubic feet, a new record. Gas production will begin soon in the recently-opened and prolific Itterbeck field.

In the first quarter 890 Mmcf of gas was produced, 106 Mmcf more than the previous quarter. This rise is due primarily to the exploration of the Frenswegen gas deposit. Until May, gas was supplied a Nordhorn textile mill from the Frenswegen field. A production test made in connection with this delivery showed that no decrease in pressure has existed. However, future Frenswegen gas will be used for repressuring Georgsdorf oil field.

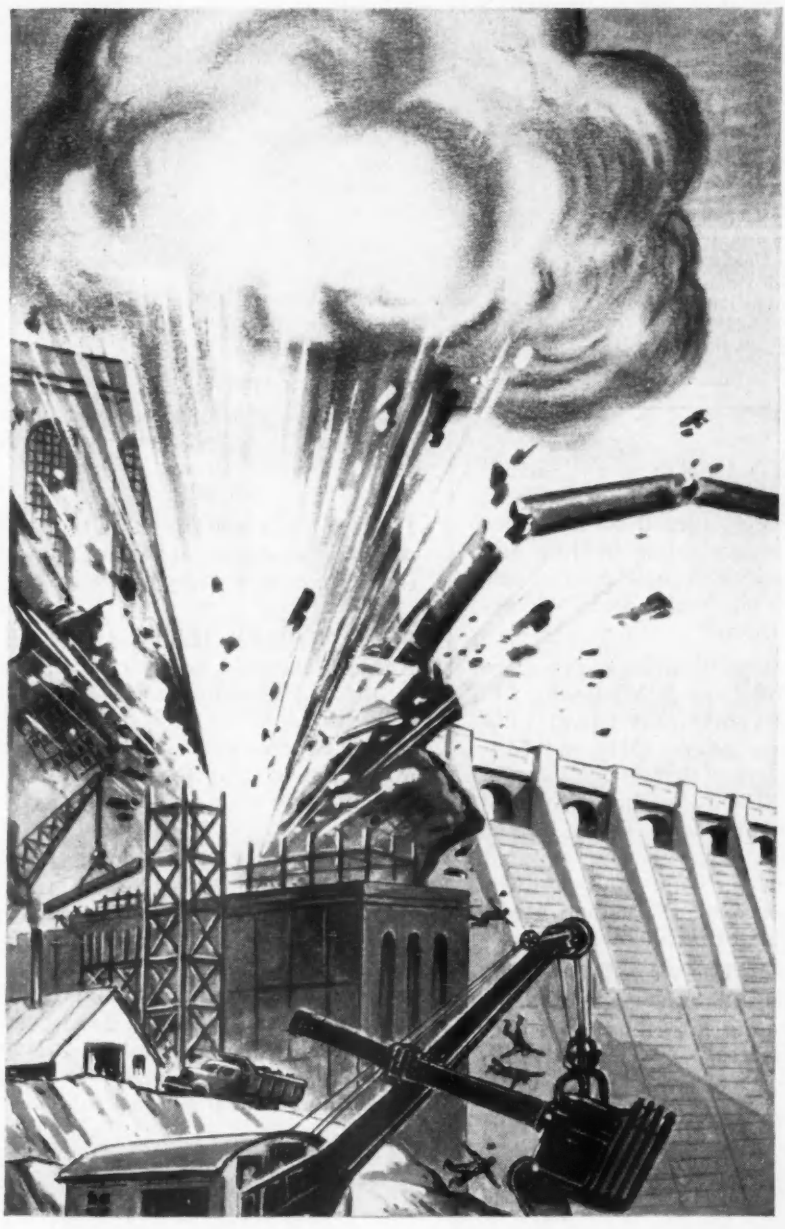
German Pipe Line Built

Niedersachsische Oelleitungs GmbH of Hamburg, Germany, has completed a 4-inch, 7.8-mile pipe line from Hohne oil field to the railway station at Beedenbostel. Hohne crude will be processed at the Deutsche Erdoel A. G. refinery at Heide (Holstein).

Finns Get Roumanian Oil

Under a trade agreement, Roumania has shipped 74,530 barrels of oil to Finland. This first consignment initiated a series of Roumanian oil exports to its pact partner, which will pay for the crude with wood, paper, residential houses and fish.

EXPLOSION RIPS HYDRO-ELECTRIC PLANT IN BRAZIL: 7 INJURED



A vast construction project nearing completion by an American construction company, today was virtually destroyed by an unexplained explosion. Four American technicians and several natives were seriously injured.

Accidents like this do happen — frequently. When they do, contractors and owners face serious financial loss — perhaps ruin.

That is why it is good business to protect your foreign interests, your property, your equipment and your liability, with sound insurance through the *American Foreign Insurance Association.*

AFIA knows the complex insurance laws, regulations and currency problems in all countries. Its years of specialized experience in the foreign insurance field, combined with the great financial strength of its 24 outstanding American capital stock insurance member companies are your assurances of insurance protection that is unsurpassed.

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Of World Oil Men

H. S. Gibson, C.B.E., M.A., M.I.Mech.E., F.Inst. Pet., managing director, Iraq Petroleum and Associated Companies, was elected president of the Institute of Petroleum for the 1952-53 session, succeeding C. A. P. Southwell, managing director of the Kuwait Oil Company. Left to right are Southwell, M.C., B.Sc.; T. Dewhurst, A.R.C.S., F.G.S.; Lt. Col. S. J. M. Auld, O.B.E., M.C., D.Sc., Gibson and Professor F. H. Garner, O.B.E., Ph.D., F.R.I.C.

H. H. ANDERSON, who effective August 1 became vice president and general manager of Trans Mountain Oil Pipe Line Company, brings to the new Alberta-Vancouver crude oil transporting company more than 35 years of experience gained with Shell Oil. Prior to his new appointment, Anderson had been vice president and general manager of Shell Pipe Line Corporation for the past 11 years.

H. H. Anderson

Anderson's first duty with Trans Mountain will be to assemble and train the Canadian staff to operate the 751-mile 24-inch line with initial capacity for 75,000 barrels daily following its anticipated completion in the latter part of 1953. Long active in the American Petroleum Institute and the recipient of its "Certificate of Appreciation," Anderson has been a member of a number of important committees in the association.

•

J. C. THOMPSON, former general accountant for Magnolia Petroleum Company, is being transferred to Socony-Vacuum Exploration Company at Calgary, Canada, where he will head the company's producing accounting department. He is being succeeded in Dallas by Edmund Decherd, who has been supervisor of the general accounting office. Decherd is being succeeded by John P. Keehan.

GRADY DAVIS, vice president, Mene Grande Oil Company, Caracas, returned to his office in Venezuela late in July and he took with him a new title (or is it nickname?)—"One-stick Davis."

He won it during his vacation on Gull Lake in Minnesota. On a golf course near Island View Lodge, where Mr. and Mrs. Davis spent part of the summer while their daughters were at a nearby camp, Davis burned up the course using a single adjustable club. And he won WORLD OIL's "Leather Medal for One Stick Shooters."

When interviewed, Davis implored, "Please report no score. I want to take those boys back in Caracas!"

H. H. BEACH has been named assistant general manager of Texaco Exploration Company with headquarters at Calgary, Alta. A native of Gleichen, Alta., Beach is a graduate of the University of Alberta, where he received the degrees of bachelor of science in mining engineering and a master of science in geology. He received his Ph.D. from Yale University.

H. H. Beach

•

F. W. RISCHMILLERZ, assistant engineer, Eagle Oil & Shipping Company, Ltd., London, retired recently after 33 years' service.

•

H. P. SINCLAIR, Shell Group installation manager at Agrud, Egypt, for the past five years, has retired.

•

MR. AND MRS. JESS C. GEORGE, Anaco, Venezuela, recently vacationed in the northwestern and west coast areas of the U. S. He is drilling foreman of Socony-Vacuum Oil Company of Venezuela, and has lived in Venezuela for five years.

•

D. C. (PAT) ENDOM, manager of material accounting for Sun Oil Company at Dallas, has been appointed office manager for Sun at Calgary, Alta.

Endom was graduated from St. Edward's University, Austin, Texas, with a degree in business administration and has been with Sun for 18 years. He is a certified public accountant.

Out-of-town visitors at the recent New York chapter of Nomads golf party were, left to right, J. Boswell, J. Boswell & Company, Japan; C. T. Longcroft, Oil Well Supply Company, England; C. O. Isakson, Colombian Petroleum Company, Colombia; L. Daniels, Arabian American Oil Company, Saudi Arabia; J. S. Page, Page Oil Tools, Inc., California, and W. Seville, Texas Petroleum Company, Colombia.

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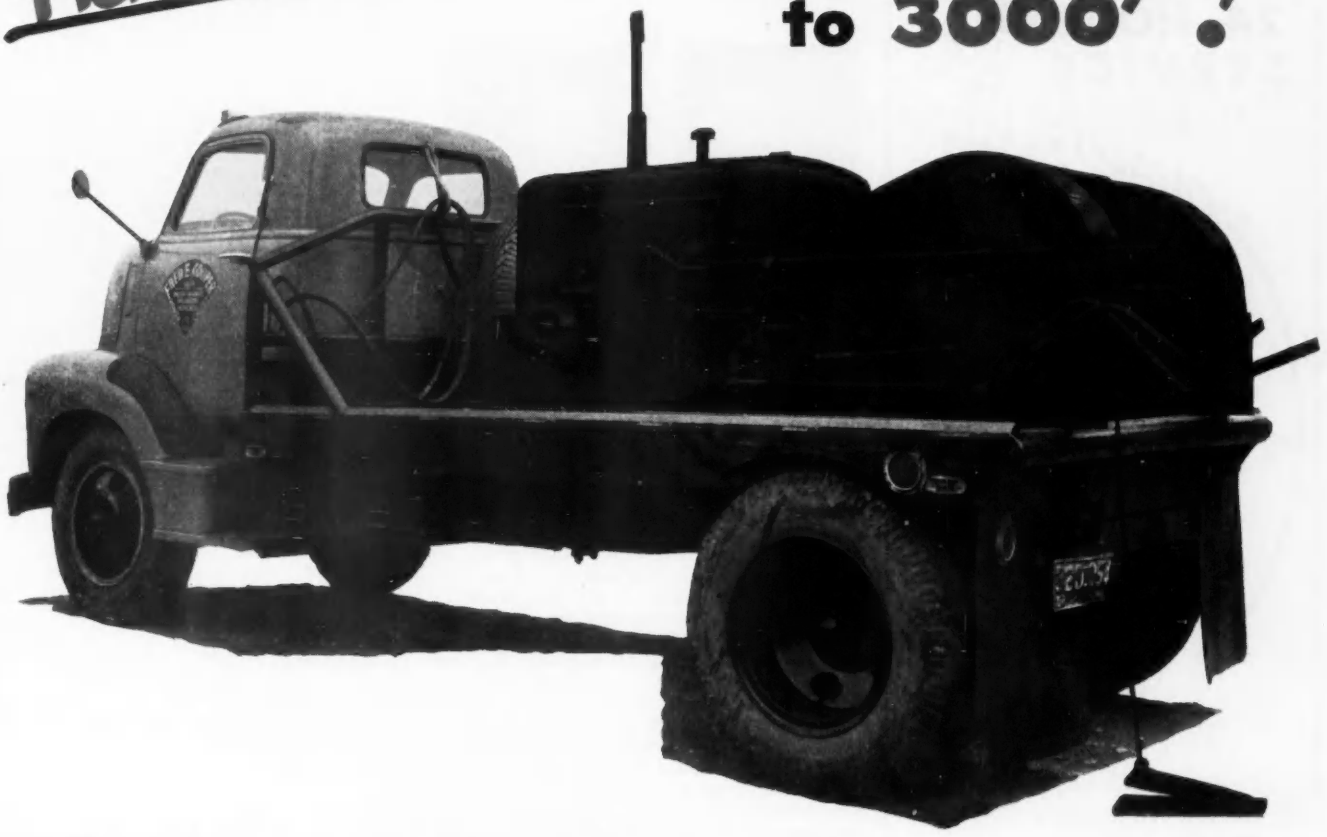

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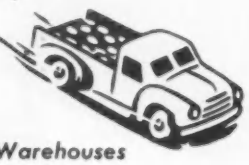

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Men in the Industry NEWS

R. Paul Huggins

T. H. Wallace

R. Paul Huggins has been elected a vice president of Gulf Oil Corporation and of the Gulf Refining Company and **T. H. Wallace** has been named vice president in charge of Western Gulf Oil Company, in changes announced recently.

Huggins joined Gulf in the Houston Production Accounting department in 1921. In 1928, he was transferred to the California operations, where the Western Gulf's first production had just been discovered. There he advanced from chief clerk to auditor, then to manager in 1936 and he was elected vice president of Western Gulf Oil Company in 1947.

Wallace joined the company in Hull, Texas, in 1926, shortly after graduating from Texas A. & M. College. In 1929, he was transferred to the Houston division, Production Engineering department. After serving in various capacities, including two years abroad as drilling superintendent for Gulf Exploration Company, in 1941 he was transferred from Houston to Bakersfield, Calif., as general superintendent for Western Gulf Oil. In 1949, he was made manager of the Exploitation department and executive assistant to Huggins.

•

Wayne C. Moody, Sunray Oil Corporation production department engineer in the company's general offices here has taken a six-months' leave of absence from his Sunray duties to join the production division of the Petroleum Administration for Defense, Washington, D. C.

Moody will join the Washington staff of PAD to be in charge of Section B group for the allocation of oil country tubular goods. Group B is the PAD section assigning allotments to all operators drilling 41 or more wells annualy.

Moody is a graduate of the University of Arkansas with B.S. in mechanical engineering, and has had ten years of field service experience with The National Supply Company before joining Sunray in 1951.

•

K. E. Tappy has been appointed superintendent of the Lima, Ohio, division of The Ohio Oil Company's Pipe Line department, succeeding the late **P. E. Thompson.**

Tappy joined Ohio Oil in 1933 as an assistant fireman at Bluffton, Ind. He was made an assistant line foreman in 1938, and promoted to foreman in 1939. Later that year, he was appointed chief engineer at Lima, serving in that capacity until his appointment as assistant division superintendent January 1, 1940.

W. H. Stueve, retired chief industrial consultant and executive assistant for Oklahoma Gas and Electric Company, was awarded the professional degree of mechanical engineer by Oklahoma A. & M. College at Stillwater. The award was given for Stueve's work in promoting the use of electric power by the petroleum industry, and was based on the submission of a thesis, entitled "Use of Centrifugal Compressors for Natural Gas Transmission."

This is the second such degree for Stueve, who, in 1936 received a similar award from Ohio State University for his thesis, "Use of Electric Power for Crude Oil Pipe Line Stations."

For 30 years Stueve performed consulting and sales work for Oklahoma Gas and Electric Company in connection with application of electric power for drilling, oil production, pipe lines and refineries. Since his retirement from that company, he has practiced in Oklahoma City as a consulting engineer, with his principal clients being pipe lines and oil producers in the U. S., western Canada and South America.

In 1942-43, Stueve acted as chief electrical engineer for War Emergency Pipelines, Inc., during construction and, later, operation of the Big Inch and Little Big Inch pipe lines.

•

Frank M. Exum, Reserve Oil and Gas Company, San Francisco, has been named assistant secretary of the company in charge of its land and lease division and joint operations with other companies.

Exum, graduate of the University of Texas, has been in the oil business for many years, principally with Stanolind Oil and Gas Company.

•

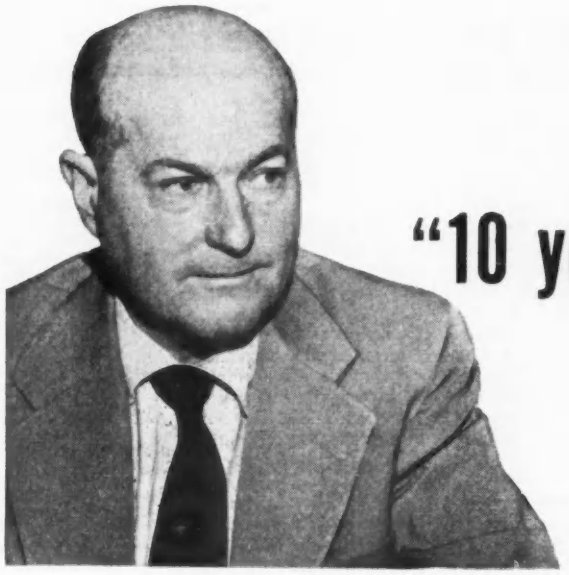
John W. Brice

O. C. Schorp

John W. Brice, who joined the Standard Oil Company (N. J.) organization in 1926 as a geologist, has been elected president of The Carter Oil Company. Brice will succeed **O. C. Schorp** who is retiring from active duty with the company.

Brice has been associated with the Humble Oil & Refining Company in Texas, the Creole Petroleum Corporation in Venezuela, Standard Oil Company (N. J.) in New York and with Carter in Tulsa.

Schorp began his career with the Jersey affiliates in 1920 in Mexico. During the past 32 years he also has worked in South America and New York. He had been with Carter since 1939 and had been the company's president since March, 1943.



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THAT'S RODMAN'S EXPERIENCE WITH

"K" MONEL Sucker Rods

Before November, 1941, the operators of Arrington No. 2 measured sucker rod life in days.

For Arrington No. 2, located in the Howard Glasscock Field, Big Spring, Texas, was as tough on rods as a sour well can be.

There was a break every 50 days. The whole string needed replacement every five months.

Then a "K"® Monel string went into Arrington No. 2. Remember the date: November 26, 1941.

Today— more than 10 years later — Mr. E. G. Rodman, of the Rodman Supply Company, owner of the lease, says:

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Figure it yourself! Those "K" Monel rods have delivered more than 3,700 days of 'round-the-clock service — better than 75 times as much as rods used before 1941!

Maybe "K" Monel is the answer to your sucker rod problem — or some other equipment problem. This could easily be, for "K" Monel resists the corrosive action of sour crudes. It withstands stress, vibration and flow-cutting. It serves dependably even in high-velocity wells that produce sand.

Want the full story? Send for our illustrated booklet, *Controlling Corrosion in Petroleum Production Equipment*. It tells what "K" Monel and other Inco Nickel Alloys can do to smooth out production bumps. It tells, too, about Inco's Technical Service, and the valuable assistance its staff offers you.

One last — and important — point. "K" Monel, like all Inco Nickel Alloys, is on extended delivery because so much is taken for defense. By ordering well in advance — and giving NPA rating and end-use information — you'll improve your chances of getting delivery when you need it.

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Still on the Job!
These three "K" Monel sucker rods are part of the string that has given more than 10 years' service in a corrosive well. Rods previously used failed in 50 days.

Herman C. Cowdery, Bartlesville, Okla., has been named assistant purchasing agent for Cities Service Oil Company (Delaware).

Cowdery received his education at Kansas State College, graduating with a degree of B. S. in civil engineering and an M. S. in applied mechanics. He did two years of research at the college before joining the Kansas State Highway Department. He joined Cities Service in 1937 as a member of its Engineering department. In 1946, he began directing the company's Junior Engineer training school. He held this position until April, 1947, when he was named buyer in the Purchasing department.

T. C. Nugent has been elected to the new position of vice president and manager—land of The California Company.

Nugent, with 15 years of service, started his career with Standard Oil Company of Texas as a clerk and was transferred to The California Company in 1939 as a title assistant. He was appointed successively assistant leaser and title man, leaser, land and lease superintendent, and in 1950 was made manager, Land and Lease division.

Other new staff appointments in the Exploration department are those of **H. N. Hickey,** chief evaluations geologist; **N. J. Smith,** research geologist; **H. T. Richardson,** chief geologist; and **H. O. Miller,** chief development geologist.

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Lower bottom hole pressure is especially important in preventing fluid evasion along with quick cleanout.
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Donald F. Sears has been named vice president of Shell Pipe Line Corporation.

Sears is a graduate of Worcester Polytechnic Institute and has a B. S. degree in civil engineering. His early work with Shell was connected with its pipe line expansion program and included the design and material estimation for the company's McCamey-to-Houston ten-inch line. In 1931, he became assistant general superintendent in charge of the company's oil gathering facilities. Three years later he was placed in charge of personnel relations and assisted in the negotiations of labor contracts.

Donald F. Sears

In 1939, Sears was made Shell Pipe Line general superintendent and assistant secretary. He spent three years in Washington during World War II with the Petroleum Administration for War. He was successively chief of the Pipe Line section, Pipe Line Engineering And Materials section and the Pipe Line Operating section. Upon his return to Shell in 1945, he was made assistant to the vice president.

For the past two years he has been on special assignment in Venezuela as director of Shell Pipe Line's participation in and coordination of construction of the Palmarejo-Paraguana Peninsula Pipe Line.

•

John A. Murphy, chief reservoir engineer for Continental Oil Company, has moved his headquarters from Ponca City, Oklahoma to Houston.

Murphy joined Continental four years ago at Ponca City as a reservoir engineer. He was promoted to supervising engineer in 1949 and became chief reservoir engineer in 1950. He was graduated from the University of California with a degree in petroleum engineering in 1942.

The promotion of three other engineers in Continental's reservoir engineering section was announced. They are **W. W. Wilson,** assistant chief reservoir engineer, and **J. R. Spencer** and **W. A. Mead,** both supervising reservoir engineers. All three will continue to maintain headquarters at Ponca City.

•

J. L. Ellis, who has been employed by Skelly Oil Company for the past 15 years in the Land department, has resigned to become an independent, with headquarters in Houston, Texas.

•

J. O. Fair has been transferred to Houston as assistant district superintendent in Stanolind Oil and Gas Company's Eastern Gulf Coast district. He was formerly field superintendent for the company's North Cowden area at Odessa, Texas.

Fair attended the University of Oklahoma, receiving his B. S. degree in petroleum engineering in 1932. He joined Stanolind in 1936 as a roustabout, and worked in Kansas and Oklahoma as an engineer and production foreman before being named field superintendent in 1945.

J. D. Wheeler has been appointed division manager of The Ohio Oil Company's Houston Production division. He succeeds the late **R. C. Gwilliam.**

J. D. Wheeler

Wheeler joined the company as district petroleum engineer in the East Texas field after experience with several other oil companies as a geologist. He was appointed division petroleum engineer at Tulsa in 1937 and later that year was transferred to the Houston division serving in the same capacity. After holding various other positions with the company, he became assistant division manager of the Houston division in February, 1952.

•

Stuart Mossom has been moved from Houston to Magnolia Petroleum Company's general offices in Dallas and made an assistant manager of the Natural Gas department. Mossom will work on special problems regarding gas units, operated by other companies, in which Magnolia participates. He will continue to be coordinator of offshore operations for the Exploration division.

Mike O. Smith, Jr., has been transferred from the Brownfield Producing district to the Salem, Ill., district as a petroleum engineer.

From the Rusk Producing district in Texas, **William G. Sole, Jr.**, has been moved to Alice, Texas, as petroleum engineer.

Thomas A. Flowers, Jr., has been transferred from the West Texas Drilling Tools department to the Petroleum Engineering department as a petroleum engineer and transferred to the Chase Producing district with headquarters at Great Bend, Kansas.

•

M. N. Broughton, New Orleans, has been promoted to division geologist, South Texas division of The Texas Company's Producing department.

Broughton was graduated from the University of Texas with a B.A. degree in 1930 and an M.A. degree in geology in 1931. He was an instructor in geology at Texas A. & M. College, 1931-1933. Starting with The Texas Company in October, 1933, he served as a paleontologist in the South Texas division at Houston. In March, 1935, he was transferred to the Louisiana division as a geologist at Shreveport. He later advanced to senior geologist in the division office.

•

C. L. Bernard has been appointed manager of the Oklahoma Division of the Pure Transportation Company. Bernard, who joined The Pure Oil Company 27 years ago, returns to Oklahoma after an assignment as superintendent of operations in the Michigan Division.

He succeeds **R. E. Young**, who has been with the company 43 years and is retiring. Bernard will have headquarters in Tulsa.

•

Dean Chrislip has been promoted to superintendent of Deep Rock Oil Corporation's Pipe Line department.

Chrislip received a B.S. degree in petroleum engineering from Tulsa University in 1941. Following graduation, he was employed by an oil company as a student engineer in its Production division and as a construction engineer for a refinery construction contractor. He served with the Navy from 1944 until 1946, when he was discharged as a lieutenant (j. g.). Chrislip joined Deep Rock in 1946 as an oil treater and gas tester at Drumright. In January, 1949, he was transferred into Tulsa as petroleum engineer, and later that year became field superintendent in production, working out of Tulsa. He was promoted in 1950 to assistant general production superintendent. In November, 1951, he transferred to the Pipe Line department as field engineer on special assignments, which position he has held until his present promotion.

•

H. J. (Jack) Readle has joined Husky Oil Company, Cody, Wyo., as manager of purchasing and warehousing.

Readle attended Northeastern State Normal College at Tahlequah, Okla. He served in Africa and the ETO during World War II as a captain. Before joining Husky, Readle was regional purchasing agent for Phillips Petroleum Company at Houston.

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R. D. Gordon, Jr., formerly division geologist for Ashland Oil & Refining Company, has been named division manager at Oklahoma City. **A. G. Burki**, division engineer, has been promoted to division production superintendent. **N. F. Mefford**, petroleum engineer in the Henderson, Ky., division, has been promoted to assistant division production superintendent.

Al Sindel has joined Ashland's Midland, Texas, office as division engineer, and **W. H. Arrington, Jr.**, is a new petroleum engineer on the Midland staff.

Frank L. Fisher has been promoted to regional geologist and will be in charge of the company's geological work.

Wallace Hanson has been named division geologist in the Midland office and **John E. Thornton** has been employed as district geologist at Wichita Falls, Texas.

James N. Brady, formerly at Ashland's St. Elmo refinery, has been transferred to Ashland, Ky., as scout for the geological and secondary recovery departments.

•

W. Perry Dornaus has joined Kewanee Oil Company as head of the Legal department. A member of the Oklahoma, Texas and American Bar Associations, Dornaus was graduated from the University of Oklahoma Law School in 1939. He worked for the law firm of Milsten and Milsten, Tulsa, until 1942, when he entered Shell Oil Company's Legal department in Tulsa. In 1944 he was employed in the Legal department of Stanolind Oil and Gas Company at Fort Worth, then in 1949 was transferred to Tulsa.

E. A. Koenig, general superintendent for Texas Eastern Transmission Corporation, has received a leave of absence to accept a one year appointment effective immediately as Chief, Gas Transmission Branch, Gas Operations Division, Petroleum Administration for Defense, in the U. S. Department of Interior at Washington, D. C.

E. A. Koenig

Koenig will serve in Washington without compensation and in his absence **H. M. McDonald**, superintendent of pipe lines, will act as general superintendent.

Koenig has had wide experience in the natural gas, oil and pipe line industries, extending over the past 28 years, and has served with Texas Eastern in Shreveport since April, 1947.

•

H. J. Struth, petroleum consultant, has established office headquarters in the Kirby Building, Dallas. He will specialize in economic research, the preparation of informational publications, and serve as advisory counsellor on matters pertaining to petroleum industry economics.

During the last two years, Struth has been spending much of his time in South America, as economic consultant to the Venezuelan Government, in connection with petroleum developments in that country. He compiled the first annual report of the Venezuelan oil industry, "Anuario Petrolero de Venezuela," which was presented at the National Petroleum Convention, held in Caracas last fall.

Prior to his foreign assignment, Struth spent a year in New York as assistant director of Public Relations for API. He was formerly editor of *The Petroleum Data Book*, and was previously with Texas Mid-Continent Oil and Gas Association, as economist and administrative assistant.

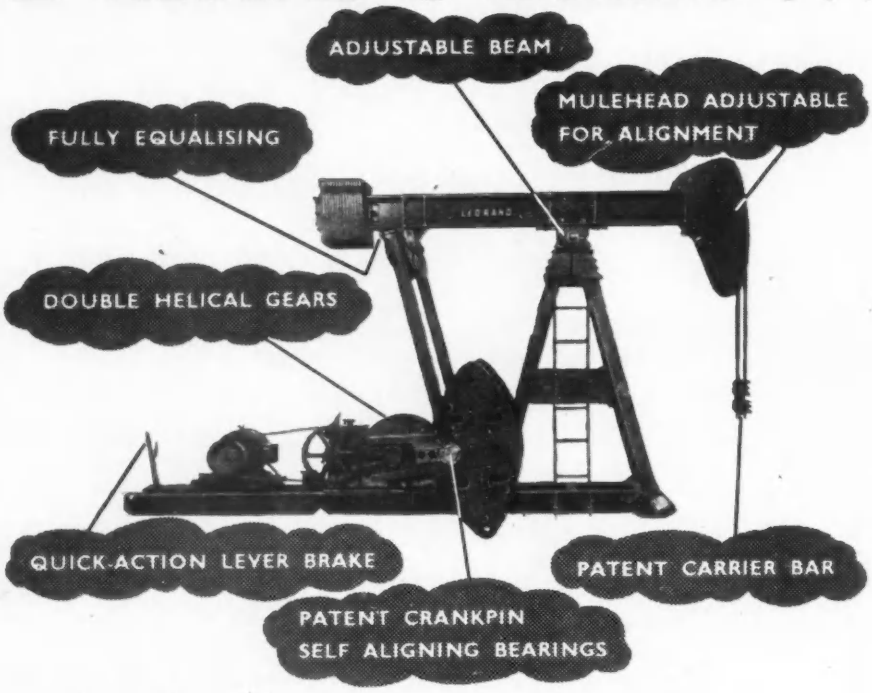
•

James J. Cosgrove has retired under the retirement plan of Continental Oil Company, but will continue to serve as a director and chairman of the board and will be available to the company in a consulting capacity.

James J. Cosgrove

A graduate of the University of Pittsburgh law school, Cosgrove practiced law in Pittsburgh five years before joining the Army. Following World War I Armistice, he was named a member of the War Department's board of appraisers in Washington, D. C., and later a member of the War Department claims board. After discharge, he was appointed special attorney for the Commissioner of Internal Revenue. In 1922 he joined the legal staff of The Texas Company, and seven years later resigned to become general counsel for Continental. He was elected a vice president in 1944 and chairman of the board in 1948.

FEATURES . . .



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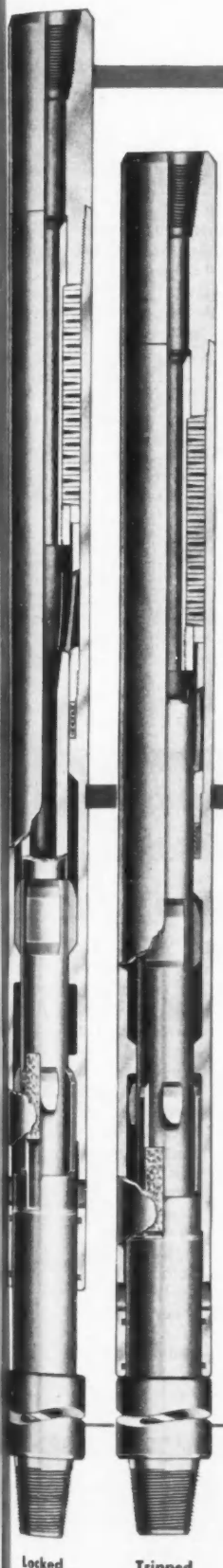

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▶On California's deepest well, a Shaffer-Waggener Bumper Safety Joint running in the drill string just above the drill collars, proved invaluable in recovering the drill string from a depth of 18,136 ft. When the string became stuck, only 2¾ turns of back torque were required at the table to release the Safety Joint portion of the tool, permitting immediate recovery of all drill pipe. Fishing jars were then placed in the recovered string, with the recovered portion of the Bumper Safety Joint on bottom, and this string was run back into the well. The tool was easily reconnected to the Safety Joint portion on the fish, and after jarring the drill collars and bit loose, the entire string was recovered—*from approximately 3½ miles deep*—leaving a completely clean hole!

▶On another well a Shaffer-Waggener Bumper Safety Joint was in the string between drill collars and drill pipe when the string parted going into the hole, dropping over 2,400 ft. of pipe and drill collars 5,000 ft. to the bottom of the well at 16,883 ft. First, the top of the fish was gripped with a socket and the Bumper Safety Joint released, permitting immediate recovery of 2,100 ft. of drill pipe. Then the upper part of the Bumper Safety Joint was run back into the hole below a set of jars, reconnected to the lower part of the Bumper Safety Joint and—after jarring—the drill collars were completely recovered *from over 3 miles deep*, leaving the hole completely clean!

▶Besides operating successfully at even great depths, this tool takes slant holes in stride—has been used efficiently in extreme directionally-drilled wells with a slant of 60°!

In fact, on job after job—from the shallowest to the deepest—the Shaffer-Waggener Bumper Safety Joint is bringing entirely new standards of safety, efficiency and protection to modern drilling operations!

Combines 2 tools in 1

The Shaffer-Waggener Bumper Safety Joint is the *only* tool of its kind—the ONE tool that combines BOTH *jarring* and *releasing* action—each under the full control of the operator. And not only does it combine in *one* tool the protection usually requiring several tools, but it also provides advantages *found in no other single tool or combination of tools!*

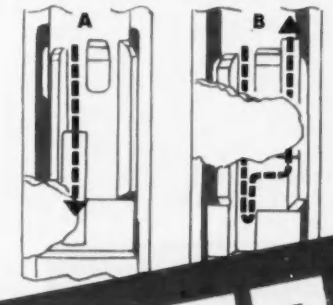
Check These Advantages . . .

To use the tool as a Bumper Sub it is only necessary to slack the weight of approximately 2000 ft. of drill string upon the Bumper Safety Joint, thus actuating a tripping mechanism which trips *automatically*, allowing the tool to strike a sharp downward blow. Raising the string then *automatically* resets the tool for another blow—and blows can be struck repeatedly and continuously by simply raising and lowering the drill string. It's simple, positive, *automatic!*

To use as a Safety Joint for quick release in the event the stuck pipe cannot be loosened, simply trip the tool and apply left torque as the string is slowly raised (A). The reverse torque rotates the drive keys into an unlocking slot (B) so that, by simply continuing to raise the string, complete release is effected. Further, the recovered portion of the tool can be used on the bottom of a fishing string and easily reconnected to the portion in the hole for simplified recovery operations.

As a Safety Joint the tool will not release until it is tripped. Therefore, it will transmit full torque loads in *either* direction—a definite advantage over conventional Safety Joints.

Two tools in one means simplified maintenance, simpler design, plus substantial savings in operating costs.



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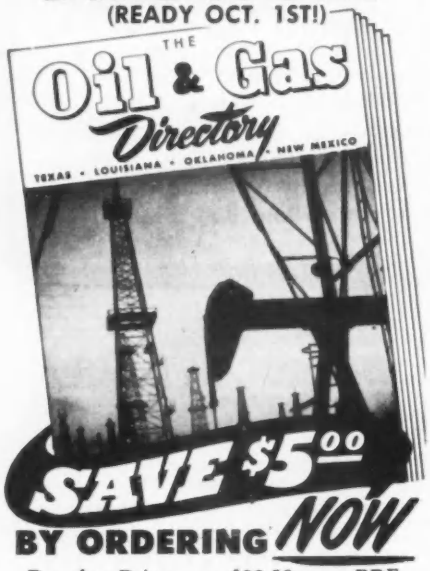

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MEN IN THE INDUSTRY NEWS

J. A. Berwick has been appointed division purchasing advisor succeeding the late **E. N. Foster,** and **Kenneth R. Woodham** has been named assistant division purchasing advisor in changes announced by Gulf Oil Corporation.

J. A. Berwick

Berwick has been with Gulf since July, 1917, and has been in the Purchasing department for many years. As purchasing advisor he will also serve the Pipe Line and Crude Oil Purchasing departments.

Woodham joined the company in 1923 and was formerly superintendent of purchasing and warehousing for the Gulf Coast district.

•

G. F. Schroeder has been appointed manager of the Contract division in Standard Oil Company of California's Producing department. He replaces **O. J. Haynes,** who has been named a vice president and director of Richmond Petroleum Company, a subsidiary.

Schroeder, previously manager of the Land and Lease division of the Exploration department, has been with the company since 1915 and has been engaged in contract and leasing activities since 1927. He is a graduate of San Francisco Law School and a member of the California Bar.

Haynes joined Standard in 1923 and has been in leasing work for the past 28 years, including four years with the company's agencies in London and Cairo. He was appointed assistant manager of the company's Exploration department in 1946 and, in 1950, was named head of the Producing department's Contract division. He is a 1922 graduate of the University of South Dakota.

•

J. K. (Booty) Adams, longtime landman for the late Mills Bennett and recently connected with Texas Eastern Production Company as Land department manager, has severed all former connections and is now located in Houston as division manager for Midstates Oil Corporation.

•

James W. Vater, Jr., has joined F. Kirk Johnson as district petroleum engineer for North Texas operations at Jacksboro, Texas. Vater was formerly with the Drilling department of Kerr-McGee Oil Industries, Inc., and for the past two years has been petroleum engineer for Champlin Refining Company, Enid, Oklahoma.

•

F. N. Bosco, geologist and petroleum engineer, has returned to Denver after secret government work in Northern Greenland. He will handle oil exploration campaigns and general consulting work in the U.S. and Western Hemisphere.

•

L. L. Jones, formerly with Warren & Bradshaw Drilling Company, has organized the General Drilling Company, and is operating two rigs, one in Garfield County and one in Garvin County, Oklahoma. The company's offices are at 2005 Liberty Bank Building, Oklahoma City.

E. A. Austin, petroleum engineer for Continental Oil Company's southern region, has been promoted to the newly created position of assistant regional manager of production. Continental's southern production region incorporates the east, south and Gulf coast portions of Texas, Louisiana, Mississippi, Alabama, Florida, Georgia, North and South Carolina, Tennessee, and part of Arkansas.

Austin joined Continental in 1939 as a roustabout at Tepetate, La., and was promoted two years later to field engineer at Ville Platte, La. He served for five years in the Army during World War II, following which he became petroleum engineer for Conoco's Texas Gulf coast district. He held a similar position in the company's Louisiana district prior to his promotion to regional petroleum engineer.

He attended Haverford College, Haverford, Pa., and Colorado School of Mines, Golden, and received a degree in petroleum engineering from the latter school.

•

S. D. Butcher, independent producer, has moved his office from Oklahoma City to Tulsa where he will be located in the Oil Capital Building.

•

Paul T. Seashore has been appointed first vice president, **Owen F. Thornton,** vice president and **Homer G. Moore,** assistant to the vice president in changes announced by The Louisiana Land and Exploration Company.

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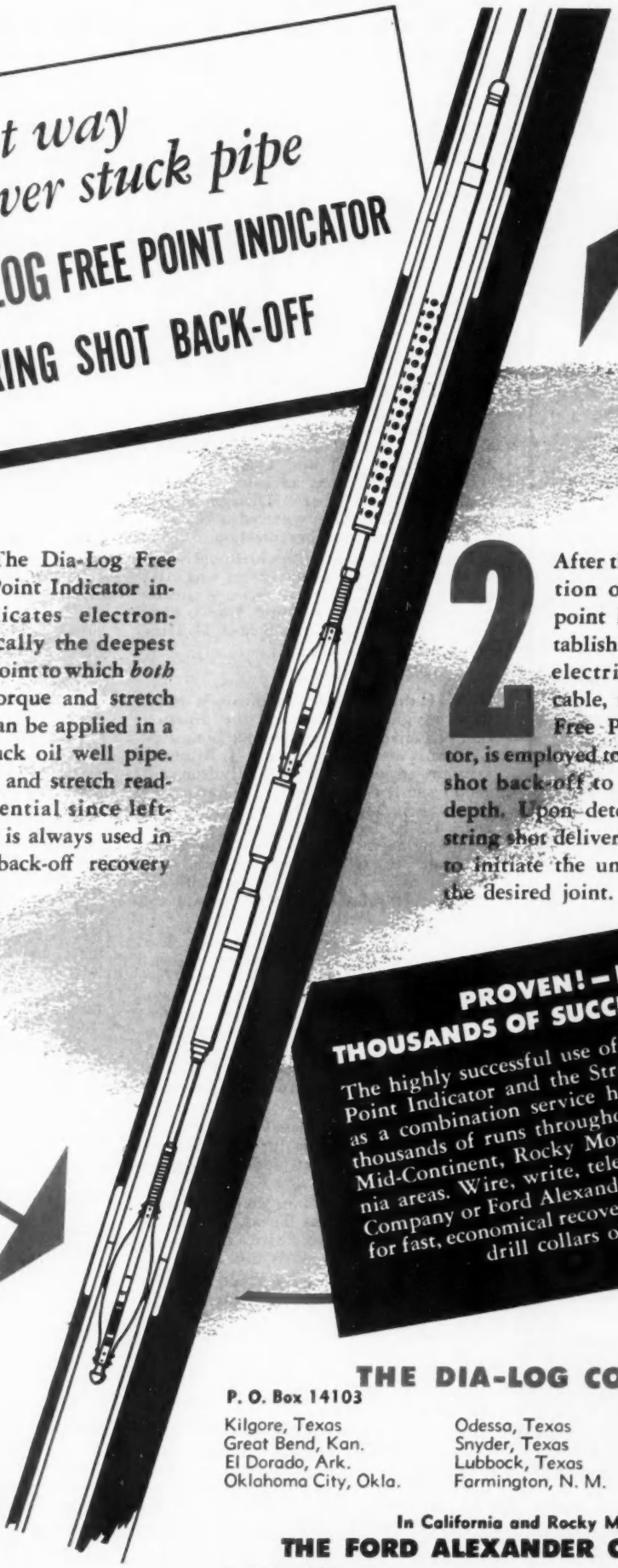

1 The Dia-Log Free Point Indicator indicates electronically the deepest point to which *both* torque and stretch can be applied in a string of stuck oil well pipe. Both torque and stretch readings are essential since left-hand torque is always used in subsequent back-off recovery operations.

2 After the exact location of the stuck point has been established, the same electric conductor cable, used for the Free Point Indicator, is employed to run a string shot back-off to the desired depth. Upon detonation, the string shot delivers a sharp jar to initiate the unscrewing of the desired joint.

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MEN IN THE INDUSTRY NEWS

J. R. Evans, an executive of Stanolind Oil and Gas Company, was named director of the First National Bank of Fort Worth.

J. R. Evans

Evans, manager and attorney-in-fact of the North Texas-New Mexico division of Stanolind since 1948, was elected a director of that organization in January, 1952. He has been with the company since it was formed in 1930. Prior to that time he had been with its predecessor company, the Midwest Exploration Company. He is a director of the Texas Mid-Continent Oil and Gas Association and a member of the advisory committee of the Southwest District Division of Production, API. He has received a "Citation of Service" from this organization.

Evans, who attended the Missouri School of Mines until his college career was interrupted by two years of service in the Marine Corps during World War I, graduated from the Colorado School of Mines in 1923.

•

H. W. Hankinson, area landman, is among those assigned to complete the organization of Humble Oil & Refining Company's California area. Others are **H. J. Baumann**, assistant area landman; **J. B. Hudson**, area geophysicist; **E. H. Bescher, Jr.**, area chief scout; **S. J. Barclay**, area petroleum engineer, **H. B. Barton**, assistant area petroleum engineer; **W. A. Castille**, area civil engineer, **H. O. Pattison**, assistant area civil engineer; **T. M. Roper**, area division chief clerk; **John A. Porter**, assistant area division chief clerk.

In the Castaic Junction district, **J. E. Cox** has been named superintendent; **T. L. Epps**, chief clerk; **J. B. Bower**, farm boss. For Bakersfield district, the company named **J. M. Sheppard**, superintendent; **Francis Pendarvis**, district petroleum engineer; **O. A. Scott**, chief clerk; **D. M. Griffiths**, district civil engineer; **J. V. Walvoord**, farm boss; **Grant A. Daugherty**, farm bbss.

Temporary training assignments recently announced by Humble for its Production Department resulted in additional personnel changes.

W. J. Barrett, assistant division superintendent of Southwest Texas, returned to his regular position as district superintendent of Government Wells district.

John J. Carter, gas contract supervisor and analyst, was named assistant superintendent of the Gas division while **R. J. Schilthuis** is on a training assignment.

W. T. Dabbs, who has been acting division superintendent in West Texas division, returned to his position of district superintendent at Snyder.

J. E. Byars, toolpusher, relieved **D. C. Rhodes** as acting superintendent in charge of operations in the Galveston Bay district, Gulf Coast division, while Rhodes is on a training assignment as assistant division superintendent in the Gulf Coast division office.

Bert E. Crowder, supervising petroleum engineer, was promoted to assistant district superintendent of the London district, replacing **Sheppard**, moved to California.

Stanley J. Lewis, assistant division civil engineer, East Texas division, transferred to the Louisiana division as assistant division civil engineer, replacing **W. A. Castille**, who was named division civil engineer of the California area.

George W. Dabney, Jr., toolpusher, West Texas division, was transferred to the Bakersfield district as toolpusher.

Everett C. Clark, Jr., district civil engineer, Sugar Valley district, transferred to the Southwest Texas division office as supervising civil engineer.

C. R. McKinnon, party chief, Gulf Coast division, has returned from military leave.

•

C. O. Stephens, H. W. Strickland and **A. G. Wolf** have been elected vice presidents of Texas Gulf Sulphur Company.

•

Lloyd Holsapple, general staff engineer for Sinclair Oil & Gas Company, has returned to the company from a six-months leave of absence during which time he was a member of the PAD Production staff. Now working in the General Production office, Tulsa, he will have special assignments dealing with engineering aspects of economics, reserves, etc.

B. P. Walts, formerly engineer-buyer, Purchasing department, has been transferred to Sinclair's Production department as general staff engineer with headquarters in Tulsa. He is assigned to engineering phases of all production equipment.

•

D. H. Scott, supervisor of The Texas Company's Geophysical operations in the Pacific Coast division, Producing department, has been transferred to the Houston Geophysical office as head of the gravity staff.

D. H. Scott

Scott is a graduate of California Institute of Technology. As head of the gravity staff, he will have charge of all phases of Texaco gravity operations.

•

Robert L. Sprinkel, Jr., has been appointed chief petroleum geologist in the Oil Development department of the Northern Pacific Railway Company. Other appointments include: **George M. Washington**, landman, **John G. Cowan**, petroleum engineer and **Lowell Huber**, chief clerk.

Sprinkel has been with Shell Oil Company for the last 15 years and immediately preceding his appointment was district geologist for Shell at Long Beach, Cal.

Washington was formerly employed by Standard Oil Company of California in the Land department, and for the past year has been an independent lease man.

Cowan was employed by Trigood Oil Company and The Pure Oil Company, and was recently released from service in the Army.

Huber has been in the office of the president of Northern Pacific Railway Company in St. Paul.

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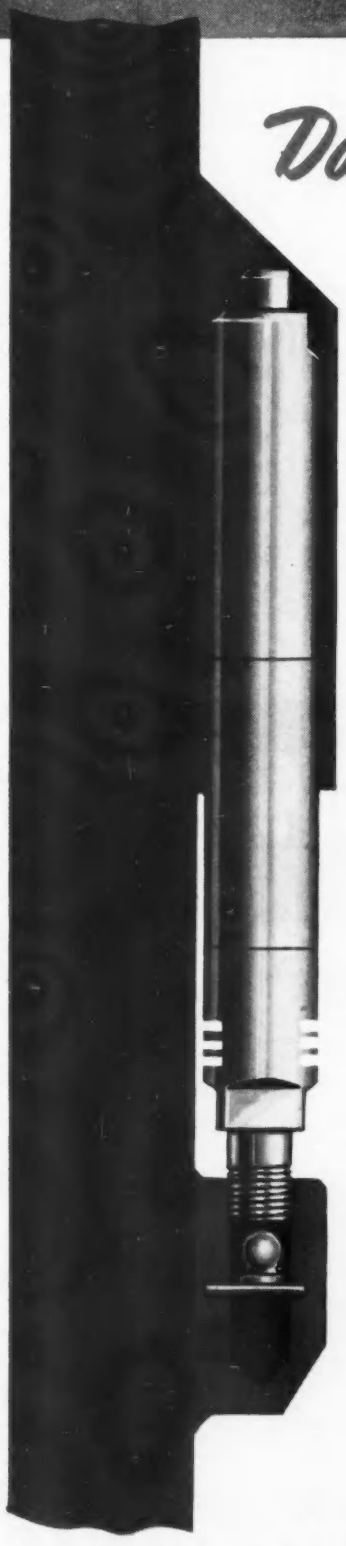

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Other patents pending.

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DEATHS

Ralph W. Gallagher, 71, who started work as an oiler in a pumping station and later became president and chairman of the board of Standard Oil Company (N. J.), died July 31. Gallagher retired in 1945 after 48 years with the Jersey Standard organization. Gallagher, the first natural gas man to head the American Gas Association, rose through the ranks of East Ohio Gas Company, then a Jersey Standard affiliate, to become president of that company in 1926. In 1933, he went to New York as a director of the parent company, and in 1937 was made a vice president. He was elected chairman of the board in November, 1942, and the following January was elected president to succeed the late W. S. Farish.

R. W. Gallagher

•

George W. Evans, 53, assistant regional general manager of Continental Oil Company's southwestern region, died July 28 in Fort Worth. He joined the company in 1922, in the Purchasing department.

•

Kenneth C. Dorn, 60, president of The Creo Oil Company, died July 31 in Tulsa. Before becoming an independent operator he had been with The Texas Company and Tide Water Associated Oil Company.

Burnett H. Crawford, 56, secretary-treasurer of the Ivy Petroleum Company, Tulsa, died July 27. He had been associated with Jarvis and Holm, independent oil producers, for 25 years. Later, he joined **O. E. Dempsey** in several oil ventures and in 1949 he and Dempsey founded the Ivy Petroleum Company.

•

Laurie Bowman, 59, oil operator of Seminole, Okla., died July 26. He had resided in Seminole since 1925 and for 18 years was general supervisor of the Seminole field for The Carter Oil Company. Later, he became co-owner of The Carter Construction Company and The Carter Producing Company.

•

Lammot du Pont, 71, of Wilmington, Del., former president of E. I. du Pont de Nemours & Company, died July 24. In 1940, he resigned as president to become chairman of the board. He was also a director of General Motors from 1918 until 1946, and was chairman of that corporation's board of directors from 1929 to 1937.

•

H. D. Hilborn, chief structural engineer for Emsco Derrick and Equipment Company, Houston, died August 2. Hilborn had been with Emsco for 20 years, and had previously been in consulting work.

P. E. Thompson, 65, superintendent of the Lima, Ohio, division of The Ohio Oil Company's Pipe Line department, died July 17. Thompson began his pipe line career in 1906 with Prairie Oil and Gas Company, and gained experience with other companies before joining The Ohio in 1912. He worked on pipe line construction projects in Montana, Wyoming, Ohio, Indiana, Texas, Kentucky and Utah, before he went to Lima in 1937.

P. E. Thompson

•

R. H. Griffin, 31, engineer with the Oil Production department of Cities Service Petroleum, Inc., New York City, died June 21. He joined the company as an evaluation engineer in 1939 following his graduation from Kansas State College and held various positions with the company until the time of his death.

•

Harold (Dick) Dunn, 86, pioneer Oklahoma oil operator, died July 26. He drilled some of the first wells in Northeast Oklahoma, operating as Dunn Brothers, drilling contractors. He was also with the Basinger Oil Company from which he retired last June.

VIKING
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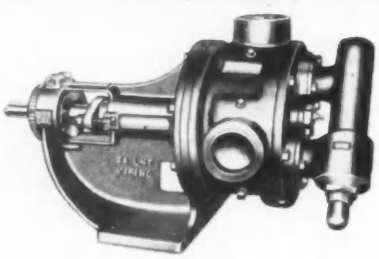
PUMPS



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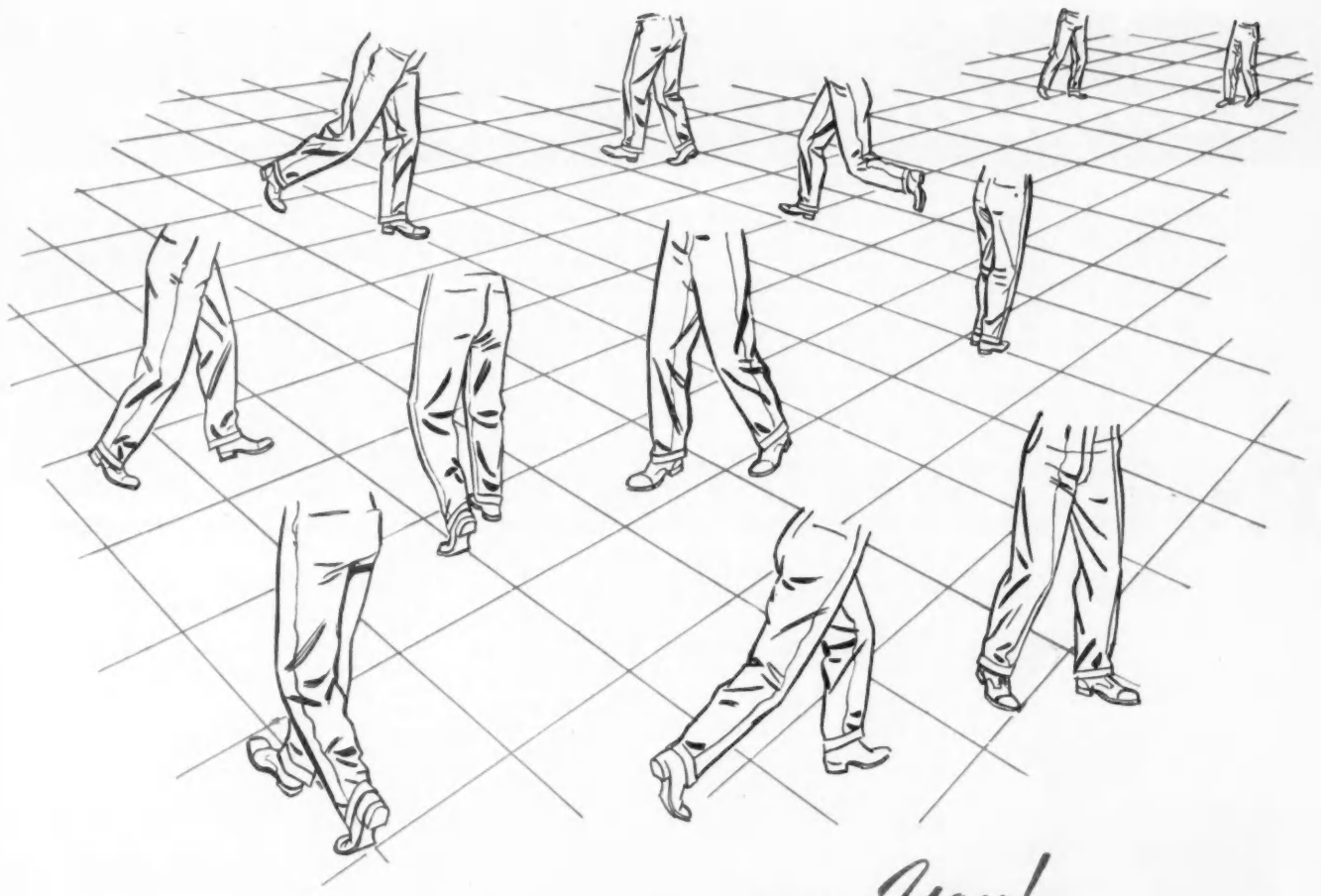

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Companies in the News

THE STANDARD OIL COMPANY (OHIO) has inaugurated a new savings-investment plan for its employes, in a move to provide greater retirement benefits to participants. Depending on the company's earnings, Sohio will contribute up to 66⅔ cents for every dollar saved by the employe. Each employe may buy U. S. Savings "E" bonds, Sohio preferred or Sohio common stock with his funds.

CONTINENTAL OIL COMPANY has set up a Thrift Plan for its 7300 eligible employes. The company will contribute about a million dollars each year to the plan, and will also pay all administrative costs of the program. An employe may deposit up to 6 percent of his base pay to his Thrift Plan account, and Continental then contributes 50 cents for each dollar deposited by the employe.

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BRADLEY, CRICHTON & ASSOCIATES is a new consulting technical firm affiliated with San Juan Oil Company. A staff of 12 professionally trained men offers all phases of consultation and evaluation, ranging from advice on exploratory ventures to engineering and financial appraisals of producing oil companies and properties. Offices are at 903 Employers Insurance Building, Dallas.

Robert J. (Bob) Bradley, president of San Juan Oil Company, is a partner in the new firm. The consulting staff will be under the immediate supervision of **John A. (Jack) Crichton**, former vice president and director of De Golyer & MacNaughton, and prior to that, geologist and engineer with Union Producing Company.

Others on the staff are **Virgil B. Harris**, engineer, formerly with Harper-Turner Oil Company and Barnsdall Oil Company; **Mac D. Oliver**, engineer, formerly with Cable and Stine, Wichita Falls consultants; **Bernard J. Esunas**, former exploration geologist for West Texas and executive vice president of Byrd Oil Company, of Dallas; **Clyde C. Harter, Jr.**, former geologist with De Golyer & MacNaughton and Continental Oil Company; **Otis T. Griffin**, formerly with H. L. Hunt, Dallas independent, and later with Grady Vaughn, Dallas operator; **R. Wayne Russell**, former exploitation engineer for West Texas with Shell Oil Company; **Walter A. Tynes**, former district geologist with Sun Oil Company's Gulf Coast division; **H. Eugene Wright**, formerly district engineer with Hiawatha Oil Company, West Texas; **W. Ray Staples**, formerly partner of Cable and Staples, consulting firm of Wichita Falls; **Kenneth C. English**, petroleum engineer and consultant, and Bradley, former head of the petroleum economics division of De Golyer & MacNaughton.

•

SHELL OIL COMPANY has opened new and enlarged offices in Billings, Mont., to take care of its expanded operations in the Rocky Mountain area. Shell first opened a Billings office in 1950, and in July, 1951, brought in the first production in the Montana portion of the Williston Basin. During the past ten years, Shell has spent more than $40 million in its search for oil in the Rockies and Dakotas, and is now investing upwards of $15 million annually in the region.

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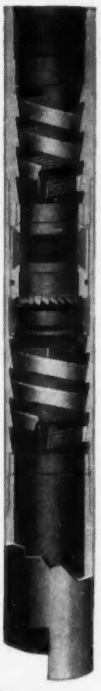

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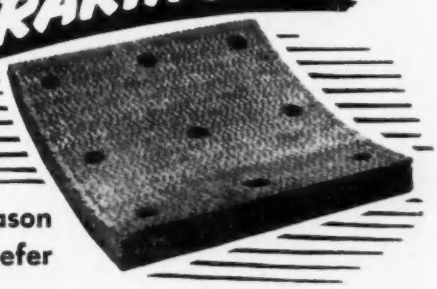

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Pacific Coast Geologists Will Meet October 30-31

The 29th annual meeting of the Pacific Sections of the American Association of Petroleum Geologists, Society of Exploration Geophysicists, and Society of Economic Paleontologists and Mineralogists will be held jointly at the Statler Hotel, Los Angeles, Thursday and Friday, October 30-31.

Ira H. Cram, vice president of Continental Oil Company, Houston, will be the guest speaker of the meeting. He will talk on "Oil Exploration".

Geophysicists Name Brewer Chairman of Annual Meeting

Richard Brewer of The Atlantic Refining Company, Shreveport, has been appointed general chairman of the sixth annual midwestern meeting of the Society of Exploration Geophysicists. The meeting will be held November 13-14, in Fort Worth, and will be sponsored by the Fort Worth, Dallas, Midland, Tulsa and Shreveport local sections of the SEG with the Shreveport group in charge of arrangements.

Leslie C. Spencer, consulting geophysicist, is chairman of the technical program committee for the meeting. B. B. Burroughs, of Sunray Oil Company, is chairman of the housing committee and will be assisted by F. O. Mortlock, of Gulf Research and Development Company, Fort Worth. Other committee chairmen in Shreveport are Bryan Duby, of The Carter Oil Company, finance committee; Roy Fischer, consulting geophysicist, entertainment committee; and E. A. Malone, of Gulf Research and Development Company, registration committee.

Brewer received a B. S. degree in electrical engineering from Purdue University in 1935. He joined Shell Oil Company in 1936 and remained there until 1942 when he received a commission in the U. S. Army. He joined The Atlantic Refining Company in June, 1946, and his present position is district seismic supervisor.

Oscar Chapman To Address Oil Compact Commission

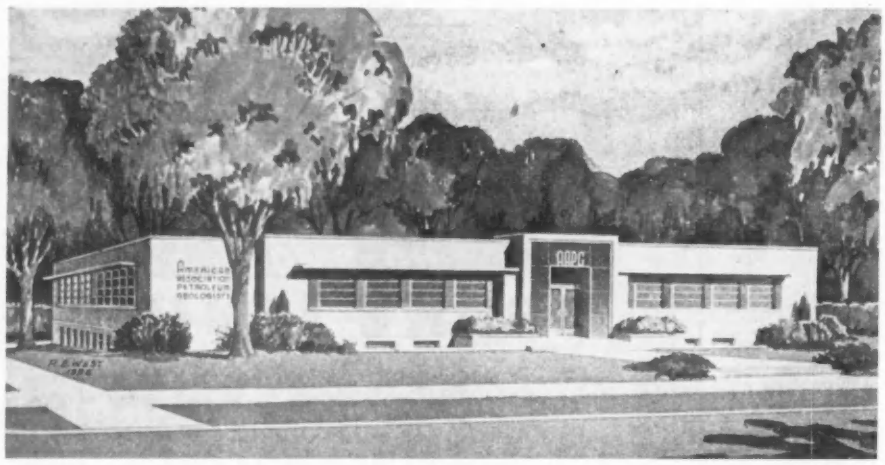
Secretary of the Interior Oscar L. Chapman will deliver the principal address before the Summer Meeting of the Interstate Oil Compact Commission at Banff, Alberta, Canada, September 1-3.

"Petroleum Conservation and Defense" will be the topic of Secretary Chapman's address, stressing cooperation between states, the federal government, and the Dominion of Canada in oil and gas conservation. Secretary Chapman will be accompanied to the meeting by PAD deputy administrator, J. Ed Warren.

NGAA Announces Convention And Regional Meeting Dates

The 32nd annual convention of the Natural Gasoline Association of America will be held April 29 through May 1, 1953, in the Rice Hotel, Houston.

Plans for three regional meetings are now complete with the following dates: Blackstone Hotel, Tyler, Texas, October 24; Herring Hotel, Amarillo, Texas, November 21; and Scharbauer Hotel, Midland, Texas, February 27, 1953.



CONSTRUCTION HAS STARTED on this new Tulsa headquarters office building for the American Association of Petroleum Geologists. The L-shaped building will have 100-foot frontage on Boulder Avenue and 70 feet along 15th Street. Business offices will be on the main floor and the basement will be used for offices and storage. The building is designed for addition of another story and there is also room for expansion on the lot. The AAPG was founded in Tulsa in 1917 and the first published roster showed 87 active and seven associate members. Today there are more than 9000 members throughout the world.

Texas Mid-Continent Group Names Five Representatives

Five Texas oil industry representatives were named by the Texas Mid-Continent Oil & Gas Association to serve on its Advisory Committee to the Interstate Oil Compact Commission. They are Curtis G. Condra, Stanolind Oil and Gas Company, Fort Worth; J. H. Dunn, The Shamrock Oil & Gas Corporation, Amarillo; H. B. Fuqua, Texas Pacific Coal and Oil Company, Fort Worth; R. G. McIntyre, Standard Oil Company of Texas, Houston; and W. A. Moncrief, Fort Worth.

The Commission, made up of representatives from oil producing states devoted to the conservation of oil and gas, will hold its summer meeting September 1-3 at Banff, Canada.

Oil Industry Committeemen Appointed by U. S. Chamber

Six representatives of the oil and gas industries have been appointed to membership on the Committee on Natural Resources of the U. S. Chamber of Commerce.

The oil and gas men are Kenneth C. Heald, vice president of Gulf Oil Corporation, Pittsburgh; C. H. Lyons, president of Lyons, McCord & Logan, Shreveport; Alvin H. Stack, president of Tampa Gas Company, Tampa; John R. Suman, vice president of Standard Oil Company (N.J.), New York; J. E. Swearingen, general manager of production, Standard Oil Company (Indiana), Chicago; and C. I. Weaver, Springfield, Ohio.

For the first time, a pipeliner will be a member of the Transportation and Communications Committee, another Chamber announcement stated. The appointee is J. L. Burke, president of Service Pipe Line Company, Tulsa.

California Oil Producers Elect Two Subcommittees

The Conservation Committee of California Oil Producers has elected its two standing subcommittees.

Lloyd Williamson, representative from District No. 4, was elected chairman of the Administrative Committee. He is president of the Lakeport Petroleum Company. Other members of this committee are Sol Alexander, W. L. Hobro, Joseph Jensen and Ross McCollum.

M. G. Arthur, representative from District No. 13, and assistant chief petroleum engineer for Union Oil Company, was elected chairman of the Engineering Board. Other members include George August, J. T. Carriel, R. C. Gentry, O. A. Graybeal, R. T. Hanson, Glenn V. Kersten, F. T. Lloyd, S. A. Patterson and Carl Tutschulte.

The new standing subcommittees will serve for one year.

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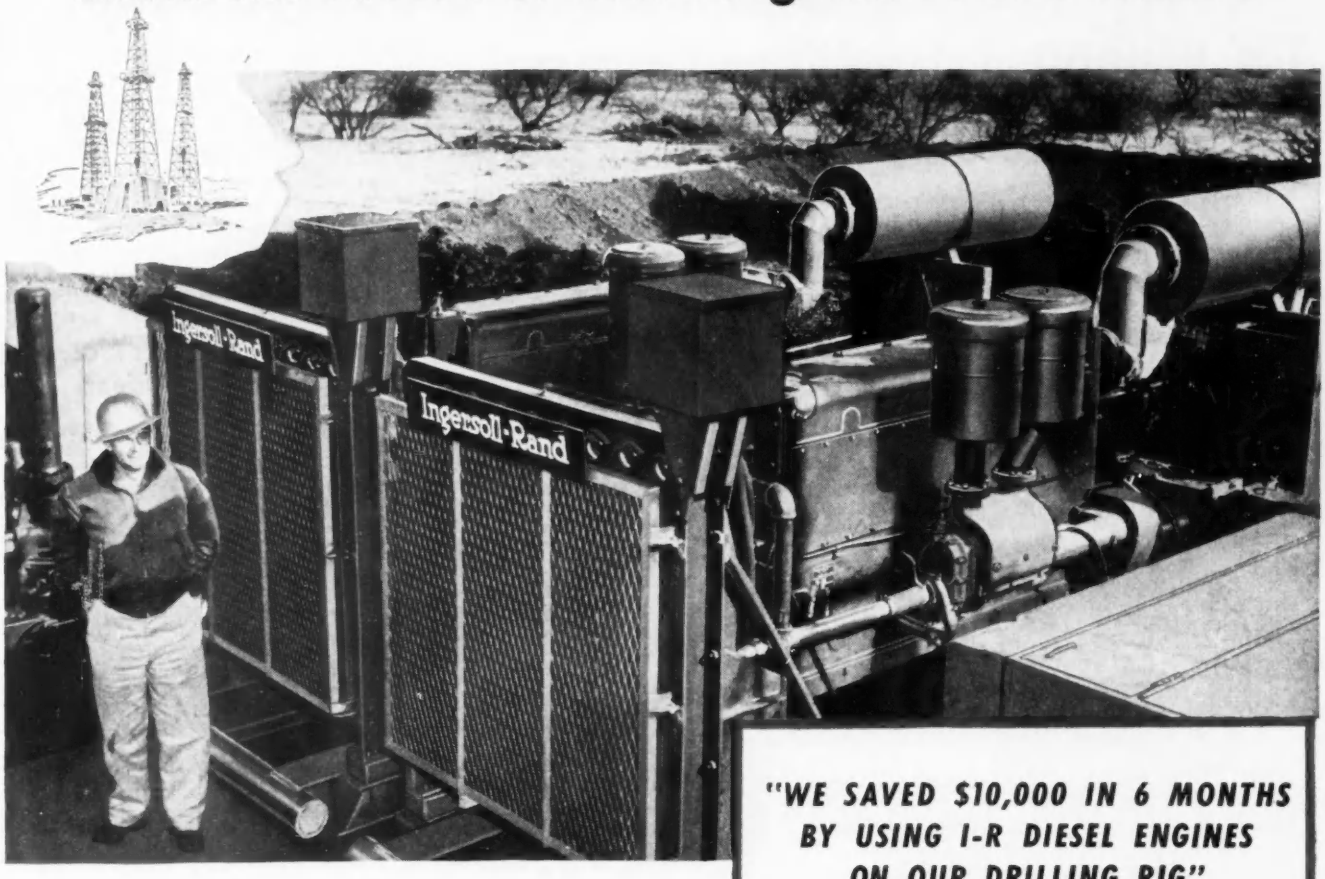
DOWN TIME COSTING TOO MUCH?

Check the record of these Ingersoll-Rand Diesels



Here's the Ingersoll-Rand drill-rig power unit that's built to big-engine standards of dependability, low maintenance and stamina, but built in a package approaching the small size and light weight of the automotive-type diesels.

The TS Diesel engine is a 4-cycle, 7" x 8½", 1000 rpm, supercharged engine built with 6 and 8-in-line cylinder and rated 285 and 380 hp for continuous, heavy-duty service . . . with ample reserve horsepower for overload periods . . . with fast acceleration . . . with lugging power at low speeds.

In the TS Diesel, you'll find modern and big-engine features like these: big 5¼" crankshaft . . . full-floating, interchangeable aluminum-alloy shells for both main and crankpin bearings . . . full-pressure lubrication . . . individual cylinder liners . . . replaceable cylinder liners . . . removable valve seat inserts . . . open combustion chambers . . . large single hole injection nozzles . . . and many others.

All these big-engine features add up to long life and less downtime.

When a drill-rig is shut down for unscheduled engine repairs, the downtime costs far exceed the natural price difference between the high-speed, lightweight automotive-type engines and the Ingersoll-Rand TS Diesel which is designed and built for rough, continuous service.

To get the facts on this TS Diesel, write for a copy of the new TS bulletin, Form 10027. Or ask your Ingersoll-Rand representative for a copy. Branches in principal cities all over the world.

"WE SAVED $10,000 IN 6 MONTHS BY USING I-R DIESEL ENGINES ON OUR DRILLING RIG"

Two 6-cylinder Ingersoll-Rand TS Diesel engines on a rotary oil-well drilling rig in North-Central Texas are shown in the photo. They replaced two automotive-type engines that had been on the rig for the previous six months.

After operating the Ingersoll-Rand engines for six months, the operators found that the running costs of the I-R units was 63.4% of that of the automotive-type units as far as lubricating oil and fuel costs were concerned. In case of engine parts and repairs, the Ingersoll-Rand engines cost only 6.8% of the others.

The drilling superintendent, an old timer in the business, stated "that they are by far the best drilling engines I ever used."

The contractor concerned wrote "All in all, computing the cost to us for each hour of down time occasioned by engine failure, we think that we have saved about $10,000 in the first six months operation of the Ingersoll-Rand engines as compared with the operations of the automotive-type engines in a similar period of time."

826-7

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ASSOCIATIONS

Independents Announce Change In Dates for Annual Meeting

The annual membership meeting of the Independent Petroleum Association of America, originally scheduled to be held October 24-25, will now be held October 23-24, the IPAA Tulsa headquarters announced.

Site of the two-day meeting will be the Skirvin Hotel in Oklahoma City.

Petroleum Will Have Big Role At Safety Congress Sessions

Drilling and production safety problems will come under close scrutiny at special sessions during the 40th National Safety Congress and Exposition in Chicago, October 20-24.

Bart Sorge of United Geophysical Company, Pasadena, Calif., will discuss "Exploration Safety," to be followed by W. S. Gage, Shell Oil Company, Los Angeles, speaking on "Safety in an Industrial Relations Program." Employe education will be the topic for M. L. Powers of Oklahoma A. & M. College, Stillwater.

At the pipe line group session Tuesday afternoon, October 21, B. G. Pierce, safety director of H. C. Price & Company, Bartlesville, Okla., will lead a panel discussion on "Safety in Pipe Line Construction."

Sessions of general interest to the petroleum industry will be held Monday and Wednesday afternoons. Topics such as attitudes and training, accident investigation, off-the-job safety programs, and new methods of fire extinguishment will be presented.

Further Plans are Announced For Desk & Derrick Meeting

Russell B. Brown, general counsel for the Independent Petroleum Association of America, will address the opening-day luncheon of the first annual meeting of the Association of Desk & Derrick Clubs of North America. The affair is scheduled for September 12-13 at Houston's Shamrock Hotel.

Mrs. Inez Awty Schaeffer of New Orleans, founder of the Desk & Derrick movement, will be keynote speaker for the Friday morning session

It had been announced earlier by Miss Blanche Kelley, first vice president of the association and program chairman for the convention, that Walter S. Hallanan, chairman of the National Petroleum Council, will address the main banquet session on the evening of September 13.

Several regional Desk & Derrick groups have elected new officers. The recently organized Long Beach, Calif., club selected Frances Rodenfels, office manager for Petrolite Corporation, as president.

Evelyn Mosher, Honolulu Oil Corporation, was elected president of the Los Angeles club. Other officers are Katherine Livada, Tretolite Company of California, first vice president; Helen Edwards, Wilshire Oil Company, Inc., second vice president; Jeanette Funston, Jergins Oil Company, recording secretary; Helen Korngut, Kettleman North Dome Association, corresponding secretary; and Mary Pancoast, American Petroleum Institute, treasurer. Directors are Ruth Stine, Signal Oil & Gas Company; Esther Johnson, Robt. S. Lytle, operator; Florence Hopkins, United Geophysical Company; Helen Hurt, British American Oil Producers, board of directors, and Anne Ketcham, General Petroleum Corporation.

Dallas officers are Martha Binford, Seaboard Oil Company of Delaware, president; Doris Whiteside, Texas Mid-Continent Oil & Gas Association, first vice president; Mary Ellen Shields, Sun Oil Company, second vice president; Dot Wade, J. L. Hamon, recording secretary; Carolyn Roberts, Jack Frost, corresponding secretary; and Martha Hughes, Republic Natural Gas Company, treasurer.

Houston Accountants Elect Mission Man as President

Anan Golub, secretary and controller of Mission Manufacturing Co., has been named president of the Houston Chapter, National Association of Cost Accountants, for the coming year.

Anan Golub

The Houston chapter is composed almost entirely of members from the oil and gas industries in the Gulf Coast area. Yearly activities of the group include visits to various industrial plants in the Houston area. A recent visit was to Old Ocean field to get a first hand look at production.

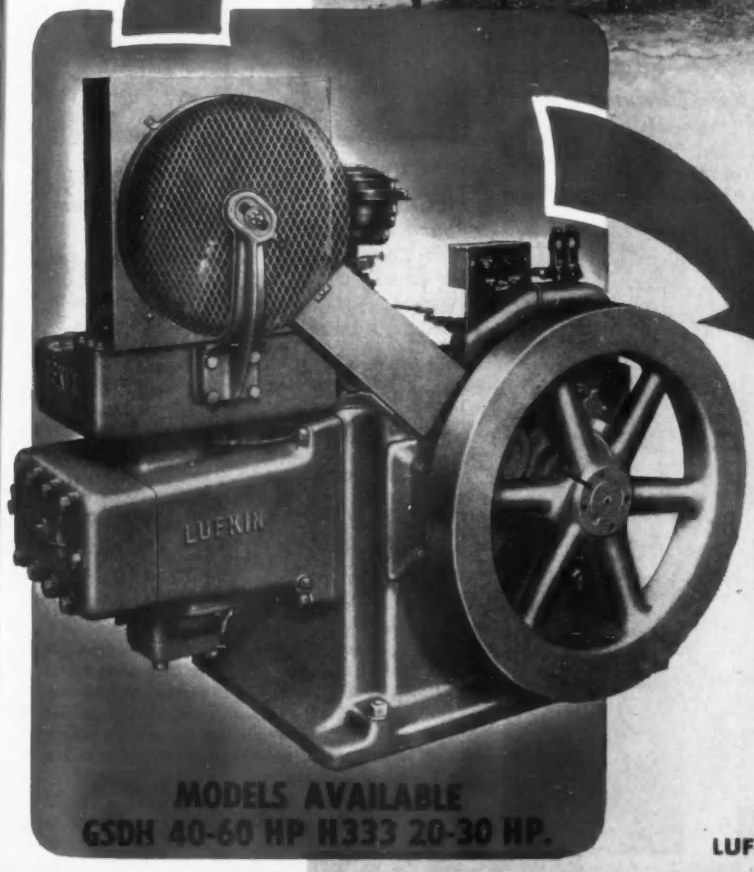
Other new officers are Emmett Day and Willis Davis, vice presidents; William Cameron, treasurer; R. B. Myers, secretary; and Riedel Wilson, W. H. Dick, Duane Geis, W. A. Garrett, Vernon Sheffield, Norman Charleton, Ivan Oden, Fred Brewer, W. F. Spencer, directors. Retiring officers and directors are R. H. Hughes, president; Louis Mills, treasurer; Gus Reeves, Joe Singleton, Roger Jackson, and Frank Higham, directors.

Topics and Officials Named For National Corrosion Meet

Topics for five of the symposia to be given at the March 16-20, 1953 Conference and Exhibition of The National Association of Corrosion Engineers at Chicago, have been selected. H. W. Schmidt, technical program chairman, also named some of the officials for these symposia.

Symposia and officials named by Schmidt are Cathodic Protection, E. P. Doremus, Cathodic Protection Service, Houston, chairman; High Temperature Corrosion, John Rutherford, Babcock and Wilcox Tube Company, Beaver Falls, Penn., chairman; Protective Coatings, L. L. Whiteneck, Long Beach Harbor department, Long Beach, Calif., chairman and N. K. Senatoroff, Southern Counties Gas Company of California, Los Angeles, co-chairman; Oil and Gas Production Industry, H. L. Bilhartz, The Atlantic Refining Co., Dallas, chairman; Chemical Industry, C. A. Coberly, Mallinckrodt Chemical Company, St. Louis.

Lufkin ENGINES



MODELS AVAILABLE
GSDH 40-60 HP H333 20-30 HP.

THE *Lufkin* H333
A DEPENDABLE RUGGED 20-30 HP OIL FIELD ENGINE

Lufkin engine-unit combination means one responsibility—one source for your entire surface pumping equipment. Fifty years of know-how in manufacturing oil field equipment is your assurance of satisfactory, long-life, low upkeep, and dependable service. The Lufkin H-333 gas engine is built around the needs of the oil fields.

- Two cylinder, two cycle, crosshead design for smoothness and long life.
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- Full pressure lubrication with oil under pressure forced to all wear points for longer life and trouble-free service.
- Easy starting by hand. Optional: Built in 12-volt electric starting system, or air-gas motor starting requiring only 25# gas pressure.

Lufkin engines can take it, which has been proven in the field over many years of continuous operation. We invite you to write direct or check with your nearest Lufkin representative for information and delivery.

LUFKIN is celebrating its 50th Anniversary this year

LUFKIN FOUNDRY & MACHINE COMPANY

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Branch sales and service Houston, Dallas, New York, Tulsa, Los Angeles, Seminole, Oklahoma City, Corpus Christi, Odessa, Kilgore, Wichita Falls, Casper, Wyoming; Great Bend, Kansas.

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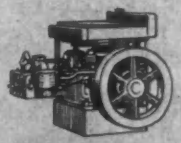
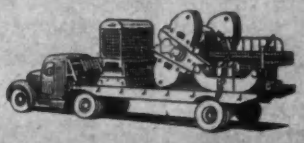


LUFKIN-COOPER-BESSEMER ENGINES



LUFKIN OIL FIELD AND INDUSTRIAL TRUCK TRAILERS

INDUSTRIAL SPEED REDUCERS AND INCREASERS

DIVISION LUFKIN FOUNDRY & MACHINE COMPANY INDUSTRIAL, MILL AND AUTOMOTIVE SUPPLIES

Equipment and Service Suppliers' Notes

L. E. Jones

Paul Bartley

Ed Reif

Ed Pool

Black, Sivalls & Bryson Appoints Four Assistant Regional Managers

Black, Sivalls & Bryson, Inc., has appointed four assistant regional managers for the Gulf Coast and West Texas Regions.

Paul Bartley, former Lafayette, La., branch manager, has been named assistant regional manager of the Gulf Coast region. He will have supervision of the Lafayette, Lake Charles, Brookhaven, Shreveport, Magnolia and Kilgore branches.

L. E. (Buck) Jones, formerly Alice branch manager, is assistant regional manager in charge of the Houston and Alice branches in the Gulf Coast region.

Assistant regional managers for the West Texas region are Ed Pool, formerly Odessa branch manager and Ed Reif, formerly Casper branch manager.

Drilling Equipment Rental Firm Elects Harold Jordan President

Harold Jordan, general manager of World Supply Company of Long Beach, has been elected president of the newly formed Drilling Equipment Rental and Service Company, which uses the trade name of "Dersco."

The new company has offices at 3480 Cherry Avenue, Long Beach, Calif., where it rents drill pipe, drill collars and casing tools.

Henry Paris is Named Distributor For Mudco Valves in Gulf Coast

Mud Products, Inc., Tulsa, has appointed Henry H. Paris, Distributor, Inc., of Houston, as Gulf Coast representative for Mudco O-Ring Butterfly Valves. The firm will serve all of Louisiana and Texas, with the exception of West Texas and the Texas Panhandle.

Reciprocating Pump Manufacturer Marks 50th Business Anniversary

The Aldrich Pump Company, founded as The Aldrich Pump Department of The Allentown Rolling Mills, this year observes its 50th anniversary. The Allentown firm, with a background of almost 107 years, ended its existence in 1951 through merger with Aldrich Pump.

Aldrich lays claim to be the first to produce high speed pumps with crankshaft speed of 60 rpm (1903) and 120 rpm (1918). The company was also first to develop porcelain plungers, to develop the Variable Stroke Triplex Pump (1926), to build 5, 7 and 9 plunger pumps, to advance crankshaft speed to 225 rpm (1939) and, in 1949, to design and build the Direct Flow Pump with speeds of 500 rpm for the three-inch stroke pump, 360 rpm for five-inch stroke pumps, and 300 rpm for six-inch stroke pumps.

Among its products today are high pressure pumps for oil field water flooding and pipe line service.

Sales of Two Jackson Divisions To Be Combined Under Hilliard

The sales of the Oil Tool Division and the PB Division of Byron Jackson Co., have been combined under the supervision

J. P. Magoffin

Ben A. Hilliard

C. F. Vincent

W. C. Brooks

of Ben A. Hilliard, sales manager of Oil Tool Division.

Hilliard will direct the sales program for the two divisions and will be assisted by three regional managers: W. C. Brooks of the West Coast, Rocky Mountain and Canadian areas, C. F. Vincent of the Gulf Coast and Eastern areas, and J. P. Magoffin of the Mid-Continent area.

These men will handle all domestic sales for the two divisions. Foreign sales will be handled by Earl M. Rees, export manager, with offices in New York.

M. L. Van Wagner

Robin Knight

R. L. Walker

Sam B. Jones

McCullough Tool Company Promotes Four Key Men in Sales Positions

McCullough Tool Company announced the promotion of M. L. Van Wagner to assistant eastern division manager with headquarters at Houston; Robin Knight to senior salesman at the Oklahoma City district office; R. L. Walker to branch manager at Snyder, Texas; and Sam B. Jones to branch manager at Hadacol, Texas.

Van Wagner started with McCullough in 1947 and advanced rapidly in service work to become safety engineer of the Eastern division of the company in 1950. His new duties as assistant eastern division manager will still include supervisory control of the safety program.

Knight, with McCullough since 1948, has held many governmental executive positions, both in the State of Oklahoma and in Oklahoma City. He has also been a general manager for three prominent Oklahoma City firms during the past 20 years. Knight's new duties as senior salesman will consist chiefly of city sales work in Oklahoma City.

Walker joined the company in 1944 and worked in the oil fields of Texas, Oklahoma and New Mexico until his present position as branch manager.

Jones joined McCullough in 1947 as a rigger at the Hobbs, N. M., branch. While still at Hobbs, he was promoted to operator and since then has worked in a great number of oil fields throughout New Mexico and Texas.

Cameron Moves Export Office

The Export division offices of Cameron Iron Works have been moved from 74 Trinity Place to 7912 Empire State Building, New York City. D. C. Washburn, who has worked in the division many years, has been promoted to assistant sales manager, Export division.

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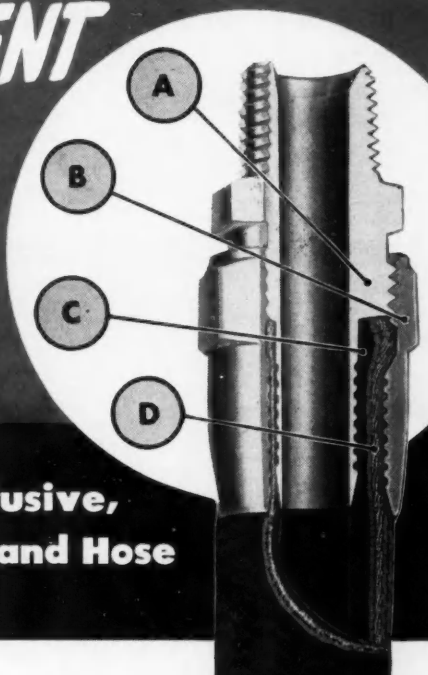
OIL-FIELD EQUIPMENT

stays "on the job" SAFELY, DEPENDABLY,



HOW IT WORKS

The thread on the body of the insert (A) and on the shell (B) is correctly designed to insure positive engagement and help prevent stripping. Anchor's exclusive patented grip provides additional packing of the hose in recess (C) and a uniform compression area (D).

. . . when you use Anchor Exclusive, Patented Reusable Couplings and Hose

All the things you want most in LPG, oil, air, and water hose assemblies — safety, dependability, easy assembly, neat appearance, lower inventories — are yours with Anchor 2-piece reusable couplings. Oil-field equipment manufacturers and users know that Anchor Couplings prove themselves under the most rugged field conditions. Anchor's exclusive patented design means money, time, and trouble saved for you, too. Look at these distinctive features:

EASY, FAST ASSEMBLY. The only tools needed to assemble couplings and hose are a wrench, an oil can, and a vise. It's that simple! Couplings can be used over and over again.

SAFER, MORE DEPENDABLE. Anchor's exclusive patented grip *keeps* hose assemblies performing *dependably* day-in, and day-out without attention — prevents leaks and dangerous blow-offs.

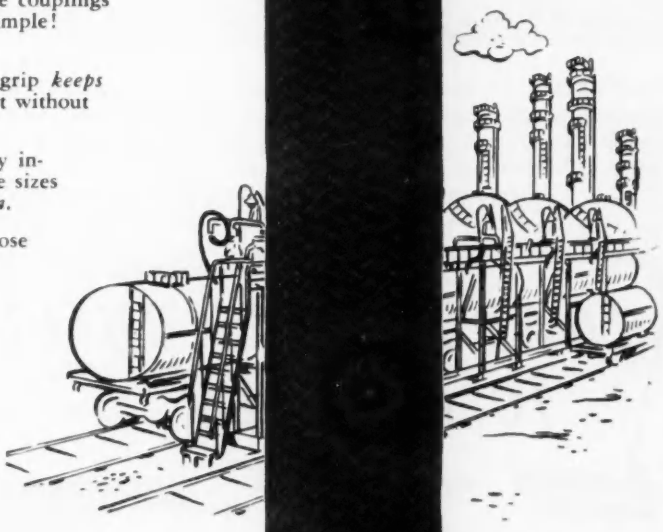
LOWER INVENTORIES. Costly prefabricated hose assembly inventories are eliminated. Just carry one coil of hose in the sizes you use. Cut it to lengths you need *when you need them.*

LESS DOWNTIME. Costly downtime in the field is cut. If hose assembly servicing is required, it can be performed immediately *without special tools.*

STREAMLINED DESIGN. Your jobs are neat and efficient, even in tight corners.

All the advantages in the most complete line of hydraulic hose assemblies and fittings available are yours with Anchor — advantages that mean your hose assemblies last longer, perform better, handle easier. So specify Anchor. Send coupon for further information.

ANCHOR



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Especially stocked for oil-field users. Fast, efficient service.

Attach coupon to your letterhead and mail today!

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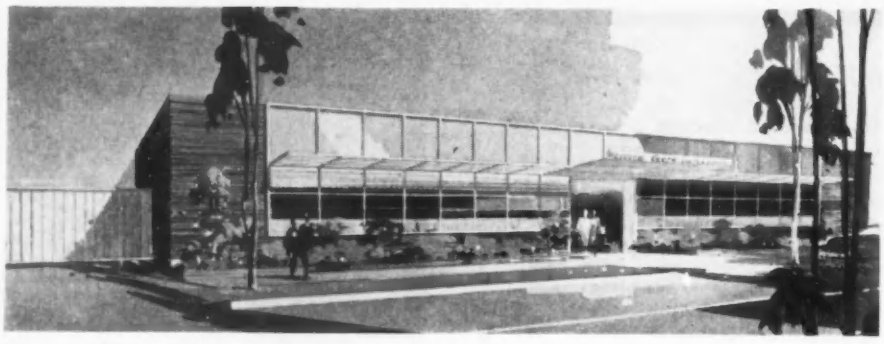
FACTORY: Libertyville, Ill. • BRANCHES: Detroit, Mich., Dallas, Tex.

ANCHOR COUPLING CO. INC.
Dept. WO-92, Libertyville, Illinois

I'm interested in Anchor 2-piece reusable Couplings. Send me further information.

NAME..... TITLE.....
COMPANY NAME .....
COMPANY ADDRESS .....
CITY ..... (...) STATE.....

BOVAIRD SUPPLY COMPANY has opened this new store at Lovington, N. M., under the management of T. B. (Tom) Pierson, transferred from Salem, Ill. The new store carries complete stocks and has available large warehouse and storage yard space.



NEW QUARTERS of Western Geophysical Company of America will be in this building now under construction in Los Angeles. To be completed early in September, the building will provide expanded administrative and operational facilities for the firm and its affiliate, Western Geophysical International. It will include a research laboratory and a mechanical section for construction of heavy equipment used in Seismograph work.

LOADCRAFT'S BUILT TO HAUL 'EM

TANDEM OR SINGLE AXLE SEMI-FLOATS
ALL TYPES OF POLE TRAILERS

Heavy loads over rough oil fields demand trailers and floats that are built rugged and can assure safe arrival of valuable equipment. That's why, for over thirty-six years, leaders in the oil industry have chosen "Loadcraft" to do the job. Bodies, fifth-wheel, axles and brakes are all designed and built right in the Loadcraft factory by experienced, quality-conscious Loadcraftsmen. Loadcraft Trailers have proved to be the work-horse of every oil field.

SPENCER SAFFORD LOADCRAFT INC. AUGUSTA, KANS.

Two New Houston Supply Companies Will Serve Producers and Pipeliners

Two new firms have been established in Houston to serve the oil industry in the South Texas area. The Oil & Gas Supply Company will handle production equipment, while Peddlers, Inc., will sell to pipe line companies. Officers of both concerns are Jack Joplin, president; Gene Rolfs, vice president; and Jud Brance, secretary-treasurer.

Jack Joplin

The Oil & Gas Supply Company will distribute Worthington gas compressors, air compressors, rotary pumps, and centrifugal pumps; Marathon electric motors and generators; Marlow self-priming pumps; and will be sole distributor for Enterprise diesel and gas engines. The company will also manufacture and assemble gas compressor units to specification.

Gene Rolfs

Jud Brance

Peddlers, Inc., will represent Gaso Pump & Burner Manufacturing Company.

Joplin was formerly division manager of Buda Engine and Equipment Company in Houston, and acted as chairman of the Texas Operating Committee of the Buda company.

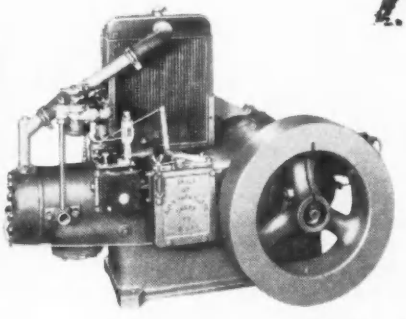
Rolfs was until recently part owner of Crutcher-Rolfs-Cummings, Inc., and Brance was formerly with Brance-Krachy, Inc.

Commercial Research Section Head Is Appointed by Oil Well Supply

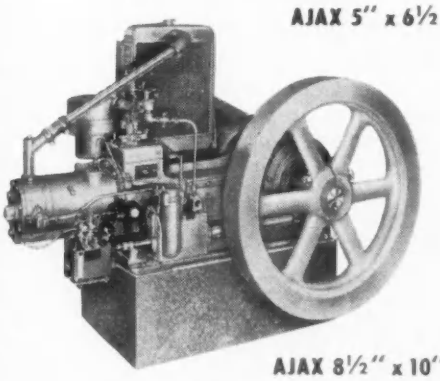
N. K. Schnaitter has been named manager of Oil Well Supply Division's commercial research section. Schnaitter began his service with United States Steel in 1946 as a sales analyst with the American Steel and Wire Division in Cleveland, Ohio, after graduation that year from the University of Pennsylvania's Wharton School of Commerce and Finance. He transferred to "Oilwell" in 1948 as a procedure analyst at the Division's Dallas headquarters and at the time of his newest appointment he was senior statistical analyst.

N. K. Schnaitter

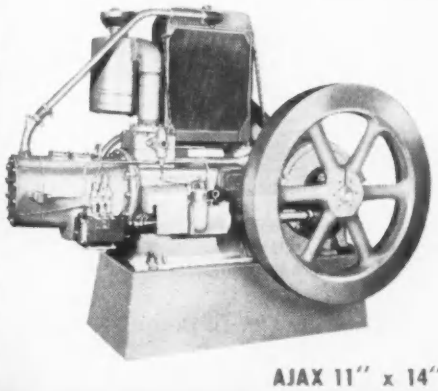
"BETTER GET AN Ajax"



AJAX 5" x 6½" WL



AJAX 8½" x 10" CMA



AJAX 11" x 14" CMD

FIRST IN THE FIELD

for sturdy dependability

The one best answer to your problems of gas engine operation, maintenance and durability is simply "Get an AJAX."

Here is the engine with a heritage of many years of easy starting, easy control, simple maintenance and long useful life—advanced and improved in every feature by AJAX *specialized* gas engine engineering.

Check around. Get the opinions of experienced AJAX owners. Then call your Supply Man for the complete story —soon!

AJAX IRON WORKS

Builders of Gas Engines • Steam Drilling Engines • Industrial Steam Engines

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Oil Field Distributors: THE NATIONAL SUPPLY CO., PITTSBURGH, PA.
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SERVICE, INCLUDING
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PRESSURE MAINTENANCE WITH GAS OR WATER
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STEEL Kelley PRODUCTS
Do You Need a Good New Source of Metal Stampings for Defense Contracts?
Kelley has the facilities, the know-how, and the men to do your job and to do it right. From start to finish Kelley is your one source—to help you engineer stampings, to design and make the tools, and, most important, to deliver the job to your specifications on time. Kelley cut its teeth in oilfield equipment, uses that experience to make your job better.
Write for this booklet, a complete description of Kelley, shows work done, lists machines, shows how Kelley will help you.
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EQUIPMENT and SERVICE SUPPLIERS' NOTES

Bill Jensen | Cliff Divelbiss | Jack (Export) Smith

Five More Representatives Complete Byron Jackson Oil Tool Training

B. A. Hilliard, general sales manager, Oil Tool division, Byron Jackson Company, announced that the Oil Tool—PB Divisions factory training program, conducted at the main plant in Los Angeles, has completed the further training of five more OT-PB sales representatives. The purpose of the extensive training program is to indoctrinate all representatives with the latest factory methods and design advances of BJ and PB Oil field equipment so they can better serve their customers in the field.

Among the five representatives who completed the program recently was Jack (Export) Smith, world traveler and BJ export representative. Also included in this class were Cliff Divelbiss, recently appointed California sales manager, and Bill Jensen, newly appointed Mid-Continent engineer with headquarters at Houston. Others included Chet Smith, Houston, and Rhoal Lyles, Hobbs, N. M.

Harold A. Hintz Appointed Sales Manager of Grant Oil Tool Company

Harold A. Hintz was appointed sales manager of Grant Oil Tool Company to succeed J. A. (Jerry) Engstrand, resigned.

Hintz studied engineering at the University of Chicago. In March, 1952, he joined Grant Oil Tool after holding positions with the Axelson Manufacturing Company and H. K. Porter, Inc., and working as a consulting engineer.

Two New Sales Engineers Assigned By Lane-Wells in Mid-Continent

W. B. (Bill) Whitcraft and R. J. (Russ) Gamberg, both of the Mid-Continent division, have been appointed sales engineers for Lane-Wells Company.

Gamberg is a graduate of the South Dakota School of Mines and served in the Marine Corps during the war. He joined Lane-Wells in 1950 and has specialized in Radioactivity Well Logging. He is currently in the Casper, Wyo. office.

R. J. Gamberg

W. B. Whitcraft

Russell, Kansas, is the home base for Whitcraft. A graduate of the U. S. Maritime Academy, he began his Lane-Wells career in 1948 as a shell loader. He was made a rigman after a few months and later became a perforator operator and finally a Radioactivity Operator.

SIVALLS TANKS, INC., has expanded its Odessa plant as shown in this aerial photo. To the left of the plant is the new office building that serves as the company's headquarters. The plant was originally established in Odessa in 1947. I. W. Lovelady is president.

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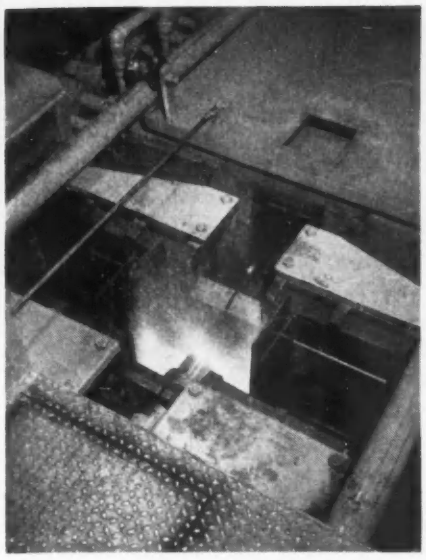
EQUIPMENT and SERVICE SUPPLIERS' NOTES



AMERICAN IRON & MACHINE WORKS Company of Oklahoma City has expanded its flash-welding facilities for attachment of tool joint to drill pipe by the installation of a new flash-welding machine at the No. 2 plant. The new Swift Electric flashwelder shown is the fifth of its kind to be manufactured, and one of the largest in existence.

Tri-State Sales Representative Is Named by Alten Foundry & Machine

Alten Foundry & Machine Works, Inc., has appointed Paul E. Winland as sales representative in Illinois, Indiana and Kentucky. Winland was formerly with the Waverly Oil Works Company at Bremen, Ohio. He served 3½ years in the Army Air Corps during World War II and was stationed in the European Theater of Operations.

P. E. Winland

Bovaird Supply Company Transfers Veteran Representative to Dallas

The Bovaird Supply Company has augmented its sales force in the Dallas district sales office by transferring Joseph Maxwell Welsh from the Tulsa headquarters. Having specialized in wire rope sales with American Steel & Wire Company in the Southwest, Welsh has had some twenty years' experience in sales in the Texas and New Mexico territory.

Welsh spent several years in his own supply business, and two years as a drilling contractor, before he joined the Bovaird Supply Company at the Tulsa sales office.

J. M. Welsh

Have you discovered these

'Hidden Values'

in Red-Strand wire rope?

You get 3 important, unseen values in Hercules *Red-Strand*.

The first is *extra endurance*.

The second is *consistently high performance*.

The third is complete *dependability*.

These values are made possible by Leschen's exacting insistence upon *higher-than-rated* quality . . . by precise, specialized manufacturing craftsmanship . . . and by the constant use of only the finest known grade of steel for long-lasting Hercules *Red-Strand* wire rope.

Service records prove these hidden values. Your records will too.

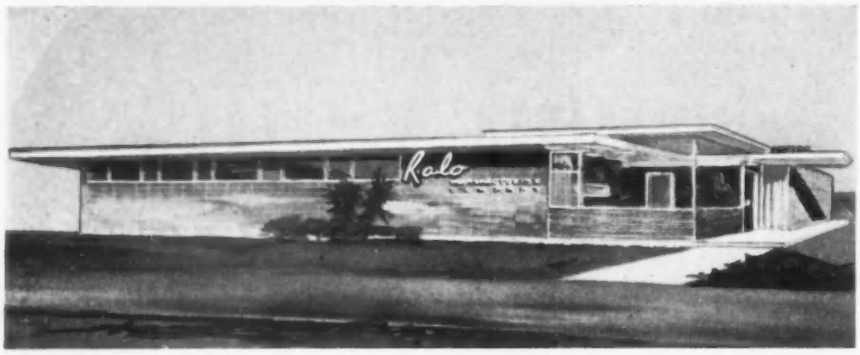
For savings' sake, find out!

Higher operating profits may be yours with Hercules *Red-Strand* wire rope. Talk it over with your Leschen wire rope specialist . . . before you place your next rope order. Or, write for bulletin.

A. Leschen & Sons Rope Co., St. Louis 12, Missouri

In business only to make wire rope — better wire rope — since 1857.

DISTRIBUTORS IN ALL PRINCIPAL CITIES



NEW HEADQUARTERS PLANT and office facilities of Rolo Manufacturing Company on a 4½-acre site at Alief and Ulrich Roads, Houston, will be occupied in August, according to R. K. (Bob) Franklin, owner. In addition to fabricating and welding facilities, the shop has a complete meter testing laboratory.

There is a difference in

needle valves

and

O·C·T makes the difference!

O-C-T Needle Valve bodies are single piece drop forged steel. The male thread is made as an integral part of the valve which gives you a more compact, stronger connection. This one-piece O-C-T Needle Valve design eliminates the use of nipples and minimizes the chances for leakage. Buy O-C-T Needle Valves from your supply store. There is a difference . . . and O-C-T makes the difference!

Oil Center Tool Co. P. O. Box 3091 Houston, Texas

Export Representatives: Sterling Areas—Le Grand, Sutcliff & Gell, Ltd., Rochester, Kent, England. Address Export Inquiries for All Other Countries to P. O. Box 3091, Houston 1, Texas.

Halliburton Oil Well Cementing Transfers Three Vice Presidents

Halliburton Oil Well Cementing Company announced the reassignment of three regional vice presidents.

Harry P. Conroy transferred from the Southern region to the Northern region; Fred R. Whitten from the Northern region to the Central region; and R. G. Kelly from the Central region to the Southern region.

These changes were made to complete the experience of the executives and to acquaint them with the domestic operations of the company.

Conroy, Whitten and Kelly will continue to headquarter at Duncan, Okla., home office of the Halliburton organization. Duties in their new assignments remain the same.

Halliburton's domestic operations are divided into three regions. The Northern region consists of the Rocky Mountain, Kansas, Oklahoma and eastern states. The Central region is composed of California, West Texas and New Mexico, North Texas, East Texas and North Louisiana, Mississippi and Arkansas. And the Southern region is made up of the Texas, Louisiana, Alabama and Mississippi Gulf Coasts and the state of Florida.

BJ Service, Inc., Promotes Box To General Staff Executive Post

William T. Box has been promoted to executive assistant on the general office staff of BJ Service, Inc.

William T. Box

Box has been an employe of Byron Jackson Company for 12 years. During the last five years he was associated with the research and development work on the Jet Process of oilwell perforating pioneered by Byron Jackson Company. He has been in charge of this work for the last three years.

In his new position, Box will supervise and direct technical aspects of all services offered and developed by the company.

Lubbock Branch Manager Named

Brooks Herring has been appointed manager of the Lubbock branch of Stewart & Stevenson Services.

The Lubbock branch, at 1614 Fourth Street, was recently given an extension of the General Motors distributor franchise so that new engines as well as parts and service are now available at Lubbock.

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EQUIPMENT and SERVICE SUPPLIERS' NOTES

GULF OIL COMPANY'S Pipe Line division chief engineer, H. A. Johns, is shown standing in front of one of the 12 16-inch BFD-E two-stage pumps undergoing official performance tests at the plant of United Centrifugal Pumps in Oakland, Calif. The pumps will be installed on the West Texas 24-inch crude pipe line, now nearing completion, which will bring West Texas oil to the Gulf Coast.

Welex Jet Announces Personnel Changes in Gulf Coast Division

Welex Jet Services, Inc., announced the promotion of W. H. Griffin from Gulf Coast division manager to the new position of assistant sales manager. Others promoted are J. B. Fleming, Gulf Coast division manager and L. M. Bracewell, Corpus Christi district manager.

W. H. Griffin

Griffin will participate in over-all management problems throughout the entire Welex service area. He will maintain his headquarters in Houston.

Fleming's new duties will include the responsibility for complete supervision of the Corpus Christi, Falfurrias, Houston and Kilgore districts.

L. M. Bracewell

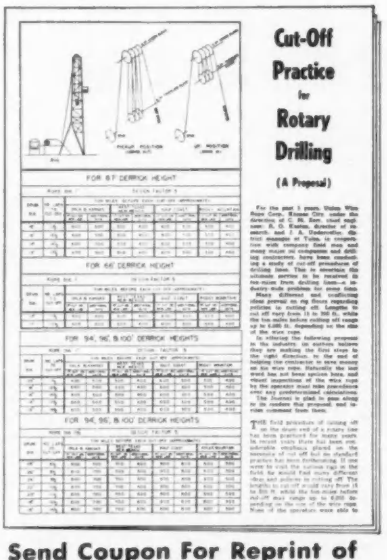
J. B. Fleming

Welex has moved its West Texas division offices from Odessa to Midland and is located in the Central Building. Wayne Satterwhite, division manager, has moved his headquarters to Midland.

Mail Coupon for Yours Today... It's FREE!

Drillers—here is an easy, surer way to establish the correct time to cut off drilling lines. When you know this, you can prevent the overloading that reduces the ton-mileage a line gives you. And, you can more often avoid the line breaks that result in costly fishing operations.

The Union Ton-Mile Indicator is easy to use. With it you get a Union Log Book to help you keep your well records. To measure ton-mileage, all you do is set the figures from your log book on the indicator and read the answer. All the complicated figuring is done for you. Mail the coupon below to have yours delivered and demonstrated to you.



Send Coupon For Reprint of Above Oil Journal Article

The information in this article is based upon a 3 year research study covering 4 major oil regions. It discloses the waste in haphazard practices and guides drillers in setting up Definite Cut-off Procedure which will result in many more ton miles of service and save money on wire rope.

USE Tuffy® ROTARY LINES

They employ a unique construction and special steels to provide extra resistance to abrasion, drum crushing, shock loads and internal friction. Tuffy *Jackknife* Rotary Line is specially designed to move at higher speeds over the smaller sheaves and drums of the *Jackknife* rig. Tuffy *Standard* Rotary Line is designed for *Standard* rigs and for deeper drilling on *Jackknife* rigs. They are easy to order. Just specify Tuffy *Standard* Rotary Line or *Jackknife* Rotary Line, the length and the size. No complicated specifications.

union Wire Rope corporation

Gentlemen:

☐ Please have your field man deliver my Union Wire Ton-Mile Indicator and explain its use.

☐ Send reprint of Cut-off Proposal.

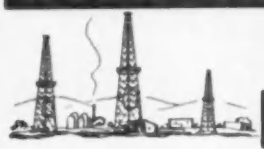
UNION WIRE ROPE CORPORATION
2104 Manchester Ave. Kansas City 3, Mo.

Firm Name.....

Address.....

City.....Zone.....State.....

WORLD OIL'S Trading Post



CLASSIFIED ADVERTISING

RATES: Regular Classified (undisplayed) **set in this size type: 12 cents per word. Minimum charge, $3. Blind box address in our care counts six words. Replies forwarded without charge. Situation wanted ads, 6 cents per word. Display ads, set in suitably larger type with ruled border, $12 per column inch; situation wanted display ads, $6 per column inch. Ten percent discount for two or more insertions of same copy in consecutive issues. All classified ads payable in advance. COPY DEADLINE: 5th of month preceding date of issue. Send copy and checks to: Trading Post Section, World Oil, P. O. Box 2608, Houston, Texas.**

FOR SALE

■ **Well drills, spudders, rotaries, core-drills. All sizes new and used equipment. Tools, drill pipe, cable, pipe. Fishing tools rented. Everything for well drilling. Pressey & Son, Pueblo, Colorado.**

■ **TWO 150 horsepower F and T boilers located at Eunice, New Mexico. Makin Drilling Co., Box 131, Hobbs, New Mexico.**

■ **Well Drilling Spudders and Rotaries, bought and sold. Immediate delivery in most cases. Specify your requirements. Contact Francisco Gonzales, Baker Export Co. Box 1128, Pecos, Texas.**

■ **One Drive Pipe and casing pulling machine complete with hydraulic pumps and jacks, winches and trip spears, mounted on truck, also winch truck and Chevrolet pick-up, everything just like new. Clark B. Peoples Co., 410 Lyman Bldg., Muskegon, Michigan.**

■ NEW WILLISTON BASIN OIL MAPS—Up-To-Date Williston Basin Map, Covering N. & S. Dakota, Montana, Wyoming. 42"x48" —$10.00 Paper, $17.50 Cloth. Also County Ownership & Lease, State, Combination, Trend and Field Maps. Austin Map Company, 509 Neil P. Anderson Bldg. Fort Worth 2, Texas.

■ 100 HP Climax power unit, twin disc clutch, new, ½ price.
140 HP JL 1335 Buda power unit, twin disc clutch, $1500.00.
D-13000 Caterpillar power unit, late model, $2,000.00.
U 6 International power unit, $450.00.
50 HP Buda power unit, model No. 326, $425.00.
1½KW DC Kohler, $295.00.
10KW AC Kohler, $695.00.
16KW Westinghouse generator, JXD Hercules engine, $1095.00.
F.O.B. 2468 E. Lancaster, Fort Worth, Tex. GORDON & POPE SUPPLY CO.

AIRCRAFT

Rugged Reliable PBY5A Catalina Twenty One Hour Cruising Range at 150 M.P.H.

Privately owned P.B.Y. major overhauled and converted to consolidated aircraft Model ACF-25. Licensed April 1952 Passenger-Cargo. Clipper bow, modified tail, cargo floors and doors, one compartment plushed with 8 seats, 2 tables. Firewall shut off valves, electric circuit breaker system, electric cowl flaps, engineers turret removed. All controls in pilot compartment. 1830-92 engines, airline type radio, DUAL ADF etc. 110 hours on airframe and engines since major. 2400 total airframe. Painted light gray and red. No corrosion. Ready to fly. Will trade for smaller ship or drilling equipment.

Dunlap & Graham, Inc.
Drilling Contractors
2450 Cerritos Avenue
Long Beach 6, California

FOR SALE

■ Manufacturers representative wanted to sell production equipment in Gulf Coast area. Generous commission arrangements and protected territory. Must supply complete information including present lines and references. Box 55-W c/o WORLD OIL, Houston, Texas.

NEW POWER PUMPS
(Not War Surplus)
For Water Flooding or Pipe Line Service
Both 6" Stroke and 10" Stroke
In Stock for Immediate Delivery
OIL & GAS SUPPLY CO.
4401 Navigation **P. O. Box 244**
Houston, Texas **Phone FA-5118**

HELP WANTED

EXECUTIVE POSITION OPEN FOR PETROLEUM RESERVOIR ENGINEER

To assume entire administration and technical responsibilities of Petroleum Production Engineering and Evaluation Department with pioneer reservoir engineering company. Must have above-average academic and professional background, specializing in secondary recovery work. Must have sound knowledge of legal and financial aspects of unitization programs, property evaluation, etc. Top bracket compensation, plus participation. Send complete resume, including age, to WORLD OIL, Box 58-W, Houston, Texas.

■ Gravity Party Chief, operators and surveyors with experience in South America. Top salary for the right men. Present personnel advised of this ad. Box 54-W, c/o WORLD OIL, Houston, Texas.

BUSINESS OPPORTUNITIES

Unparalleled opportunity for lease owners of wildcat blocks with geology or geophysics. The Geophysical Survey Syndicate has connections with ample capital to develop wildcat properties, where our report results favorably.
4133 Sunnyslope Avenue
Sherman Oaks, California
State 4-6903

■ **WE WILL BUY** Producing Oil Royalties. Send Particulars. Standard Security Co., 111 Broadway, New York 6, New York.

SITUATIONS WANTED

■ PETROLEUM PRODUCTION student, International Correspondence Schools, completed Mathematics-Physics, Chemistry, Inorganic; Organic, "B" average, continuing Qualitative Analysis; age 43, wife Mexican National; speaks Spanish, tropically adapted. Any type work begin. Southwestern United States, Mexico. Not labor-union. Cecil Austin, 404 E. St. Francis St., Brownsville, Texas.

Continental Announces Promotions

J. A. McCreery has been named manager of the Elk City, Okla., store in personnel changes recently announced by The Continental Supply Company. Other promotions include those of E. D. Lawrence, sales representative, and Sidney G. Pierce, manager of the McAllen, Texas, store.

Franks Promotes John Leyh

John G. Leyh has been appointed assistant sales manager of Franks Manufacturing Corporation, Tulsa. Leyh, who has been with Franks 12 years, was assistant service manager prior to his new appointment.

SITUATIONS WANTED

■ ACCOUNTANT—Auditor, Venezuelan Nationality, 28 years old, university education, 3 years auditing (oil companies) experience with one of the largest U. S. Public Accounting Firms; 2 years oil accounting with a U. S. Oil Company in South America; also taxes and labor laws; present income $8,500 after taxes. Preferably abroad. Box 57-W, c/o WORLD OIL, Houston, Texas.

■ GEOLOGIST—Young, PhD., four years experience in research. Desires connection—preferably in foreign operations. Box 56-W, c/o WORLD OIL, Houston, Texas.

Drilling contractor operating in West Texas and New Mexico desires to contact small or medium-sized independent oil company who needs an operating manager. Personal interview desired. Twenty years experience in all phases of the oil industry. Address replies to Box 94-W, WORLD OIL, Houston 1, Texas.

LEASES

100,000 ACRE LEASE
Southwestern Alabama

Large lumber company has approximately 100,000 acres of unleased land located between the Pollard Field and Mississippi Production. Includes several known geophysical structures. Wish to contact major company or substantial independent operator capable of developing this large property. Will deal only with principals. Box 53-W, c/o World Oil, Houston, Texas.

DECALS

TRUCK LETTERING AND TRADEMARK decals made for your trucks. Easy to apply, uniform, distinctive, economical for small or large needs. Write for Catalog. Mathews Company, 827 S. Harvey, Oak Park, Ill.

PRINTED FORMS FROM STOCK

Immediate delivery of producing and pipe line forms made from our complete line . . . Write for completely illustrated catalog.

GULF PUBLISHING CO.
P. O. Box 2608 **Houston 1, Texas**

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New Books, Maps and Movies

DRILLING AND PRODUCTION PRACTICE, 1951 Edition. American Petroleum Institute, Division of Production, 816 Rio Grande National Building, Dallas 2. $5.

The new edition of this standard reference contains 30 papers selected from those presented at Division of Production district and annual meetings during 1951, and a bibliography of all papers presented at district API meetings. In the drilling section are articles on surface equipment, bits, drill stems, casing, cements and cementing. Production papers discuss problems of reservoir analysis, fluid injection, logging, surface equipment, rods and tubing and corrosion. Other articles are concerned with field development and completion and remedial practice.

OIL WELL CEMENTING TECHNIQUES. Color film. Weatherford Oil Tool Company, Weatherford, Texas, and Houston. Special showings on request.

For the first time, a complete picture of what takes place under the ground during cementing procedures is available in a color film. About one-half of the 15-minute film is concerned with live action above ground, while the remainder presents an animated description of cementing the pipe in the hole. Installing cementing tools, scratchers and centralizers on the casing is shown in detail. The proper method of rolling the pipe, spinning and stabbing it, is then illustrated in live photography. Next, attachment of the Hall cementing head and reciprocation of the casing to prepare the annulus of cementing is shown. The movie illustrates how mud and sloughings build up a filter cake to seal against fluid loss and bring about a uniform cement bond which keeps pipe from sticking.

SECONDARY RECOVERY OPERATIONS IN KENTUCKY. Interstate Oil Compact Commission, P. O. Box 3127, State Capitol, Oklahoma City 5. Free.

A joint survey by the State of Kentucky and the Interstate Oil Compact Commission is reported in this pamphlet by Dan J. Jones, chairman of the Kentucky Secondary Recovery Committee and members of the committee in cooperation with IOCC Secondary Recovery Division. The summary is complete through 1951 and includes annual Kentucky oil production by counties. Data on 17 projects are included, as well as information on future prospects. There is an oil and gas map of Kentucky showing the projects and fields, together with the stratigraphy of the water-flood projects in eastern and western Kentucky.

GEOLOGY OF BEAUREGARD AND ALLEN PARISHES. Louisiana Geological Survey, Geology Building, L.S.U., University Station, Baton Rouge, La. $1.

This bulletin, No. 27 in a series, contains a surface geological map of the area, together with a discussion of the surface formations. It also has sections on the subsurface stratigraphy, structure and petroleum geology of the area.

STOP FIRES—SAVE JOBS. 16 mm sound motion picture. Audio Productions, Inc., Film Center Building, 630 Ninth Avenue, New York 19. $47.

Endorsed by the National Board of Fire Underwriters and the Factory Insurance Association, this movie points out to each employe his personal responsibility for fire safety. The picture explains the three principles of fire safety: fire protection engineering, management cooperation, and employe cooperation. Dangers of specific fire hazards, such as vapors, dust and lack of precautions in jobs like welding, are illustrated. Also shown are the types of fire extinguishers which should be used for each type of fire.

DEEP WATER. 16 mm color motion picture. Layne & Bowler, Inc., P. O. Box 6697, Hollywood Station, Memphis 8, Tenn. Available for group showings on request.

Ground water development is the subject of this movie, which depicts the complete story of well water development from the initial survey through engineering, construction, testing and actual use.

"Tis' a foolish mon", says Scottie McBlock, "who wastes time and energy for the lack o gud tools to work with."
McKissick
"SPEED NUT"
SNATCH BLOCK
IS THE WISE BLOCK TO USE for maximum ease of operation.
A quick whirl of the nut, BLOCK is open . . . Nut is never removed.
Drop forged, heat treated steel. Hy-speed bronze bushings of HY-load roller bearings - alemite lubrication.
McKissick Builds A Better Block For Every Purpose.
Catalog on Request
McKISSICK
McKISSICK PRODUCTS CORPORATION
Box 2496 Tulsa, Oklahoma

Reduce

YOUR LIFTING COSTS

Use

O'BANNON VALVE CUPS

O'Bannon Valve Cups are skillfully made of carefully selected materials, in an up-to-date, modernly equipped plant. They are formed, punched and trimmed to exact size. They are first quality and they will give you first class service.

O'Bannon Armorflex Valve Cups have wearing surfaces of nylon, the strong, tough material which is extremely resistant to abrasion. They last longer in tough wells.

Next time you buy valve cups, don't just ask for "valve cups." Specify O'Bannon Valve Cups and get the benefits of longer wear.

AVAILABLE AT YOUR SUPPLY STORE

Walter O'Bannon Co.

Tulsa 1, Oklahoma

SQUEAKS from the BULLWHEEL

Local Color

An artist ran across a quaint character in the mountains recently. "I'll give you five dollars if you'll let me paint you," the artist said.

The character hesitated, and scratched his head.

"I'll pay you in advance." the artist said, reaching for his wallet.

"That ain't a botherin' me," the hillbilly said, "I was jest wonderin' 'Iffin I could git the paint off afterward."

Home Maid

Lady (engaging new maid): "And what denomination are you?"

Maid: "Well, mum, mother goes to the Baptist Church and father goes to the Methodist, but speaking for myself, I'm radio."

One Big Happy Family

A mild little man walked into an income-tax inspector's office, sat down and beamed on everyone.

"What can we do for you;" asked the inspector.

"Nothing, thank you," replied the little man, "I just wanted to meet the people I'm working for."

"Fishtails—and I thought I was signing for bits!"

Bad Business

A merchant was dying and his wife, two daughters and three sons were at the bedside. Finally his wife bent over him and sobbed: "Can you hear, father? We are all here. Your daughters and sons and old Mary, praying for you." With a scream of anguish the old man sat up in bed. "Then who in hell's looking after the store?"

Greatest Name in Cable Tools

Fig. 179 Acme W. L. Knife Cutters

See Acme's Insert in 1951 Composite Catalog. Also write for more complete Catalog, containing valuable cable tool "use and care" manual.

Acme's Wire Line Cutting Outfit. 51-years' specialized "know-how" makes it worth more to YOU.

Acme

TRUSTWORTHY SINCE 1900

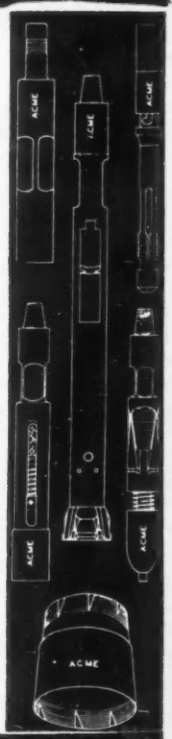
PETROLEUM EQUIPMENT SUPPLIERS' ASSOCIATION MEMBER

. . . to-be-Sure — Always Ask for Acme's W.L. Cutting Outfit

"Acme's WL Cutting Outfit is MOST Safe, Sure, Quick, Clean-Cutting means of parting cable from stuck tools," say Driller-owners.

Its EXCLUSIVE feature is cutter's assemblage: Cutter-edges so spaced that each snips separate cable-strand, yet altogether cutting 6-strands at 1-clean "bite." No frayed ends. Cuts cable in 4" hole or larger. Smaller on special order. Outfit consists of Knife, Jars, Sinker, Rope Socket, Wrenches. With simple precautions, runs without wrapping.

Unique, patented design of life-long driller. Every part meets ALL correct-steel, controlled heat-treatment and precision-crafted standards, making Acme's famous-favorites since 1900.



ACME FISHING TOOL CO. PARKERSBURG W. VA.

Export Office:
19 Rector St., New York 6, N.Y.

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Looking Ahead

Lay in supplies of heating oil, kerosine and diesel oil to avoid shortages in coming winter. This was the warning issued early last month by PAD to East Coast consumers. Supplies are expected to be tight even if weather is only normally cold. Very tight if colder. Refiners' storage tanks are getting full. Consumer buying is urgently essential.

A $10-20 million gas processing plant is planned by Amerada Petroleum Corporation on its extensive Williston Basin properties. Plans are tentative. Plant would recover gasoline and sulfur from the casinghead gas from oil wells, and residue gas would be sold for marketing by pipe line. Further drilling and knowledge about producing reservoirs is essential, however, to determine details of plans for the gas processing plant.

Tariff of 45 cents per barrel has been set tentatively by Trans Mountain Oil Pipe Line for moving Western Canadian crude from Edmonton to Vancouver. About half of expected initial throughput of 75,000 barrels per day will be exported to California, the U. S. Pacific Northwest, and other markets. On those shipments, the charge for loading tankers at Vancouver likely will be 2½ cents a barrel. Line is expected to be completed in August 1953 and to deliver crude in Vancouver in October 1953.

Oil industry earnings in 1952 may set an all-time record for second straight year. A record demand of 4.3 percent above 1951 has been forecast. Near record levels of operations in latter half of 1952 will offset interruption of business by strikes in initial half. For first half of 1952 earnings were about 2 percent short of those in like period of 1951, as drop in second quarter due to strikes outweighed earnings gains of first quarter, when profits averaged about 6 percent higher than for the same period of 1951.

Further expansion of petrochemical industry is in prospect. Industry investment is already more than $2 billion, compared with only $350 million in 1940. Chemicals made from petroleum now account for output of 17 billion pounds of organic chemicals annually or 25 percent of all chemical production. It is expected that within 10 years, petrochemicals production will double and represent 50 percent of total chemical output.

What does the future hold for atomic power? On commercial basis it may offer competition to oil, gas, and coal within 10 to 20 years, following introduction on modest scale within five years. Oil men must keep abreast of atomic developments, through research and otherwise, to know all the possibilities raised by this vast new potential power supply. It represents a fuel so light and compact as to be readily and economically transportable, even to distant locations, and could have an almost revolutionary effect on the economy generally.

The C.I.O. Oil Workers International Union has set a wage policy. The organization will not tie its wage objectives to cost of living index alone, but will seek additional "modest but continuous increases based on increased productivity." Policy was enunciated recently at the 110,000-member union's annual convention at Philadelphia. The union will continue to seek company-wide bargaining instead of present plant-by-plant bargaining. It will also try to secure pension plans administered jointly by both employers and employes.

new production from old wells

Reconditioning by Dowell Service

BOOSTS PRODUCTIVITY AND PROFITS

Take a look at your old wells. They may be capable of added production if properly reconditioned. This is particularly important when steel or other shortages prevent new drilling.

When old wells have declined in productivity, been deepened or plugged back to a new horizon they are often perfect subjects for Dowell's Reconditioning Service. Wells completed in many different formations have been improved by Dowell's treating techniques.

Your nearest of over 90 Dowell offices is well staffed with engineers trained in expert reconditioning. Now is the time to call Dowell for work on old wells.

Ways to New Production

ACIDIZING An old well, completed in the Miocene sand, had declined abnormally from a large initial production to 20 BOPD. This was due to plugging by both paraffin and accumulated clay-like materials. Dowell treated the well with Formation Cleaner then acidized with Mud Acid. Result: production was increased to 180 BOPD.

STRATA-FRAC This well's initial production was 19 BOPD in March, 1950. While the well had not declined, it was not considered good for its location. Various remedial methods failed to boost oil flow. Then Dowell treated the well with Strata-frac. Result: production was increased to 45 BOPD with payout time estimated at 36 days.

PLUS THESE EXTRA AIDS TO RECONDITIONING

Etching Acid • Strata-lift • Channeling Acid • Sand-frac • Temporary Plugging
Selective Acidizing • Permeability Surveys • Spinner Surveys • Water Locating
Caliper Surveys • Temperature Surveys • Glass Gun Perforating

DOWELL SERVICE

Acidizing • Jel-X • Electric Pilot • Perfo-Jet • Paraffin Solvents • Jelflake
Bulk Inhibited Acid • Chemical Cleaning for Heat Exchange Equipment

DOWELL INCORPORATED • TULSA 1, OKLAHOMA
A Subsidiary of The Dow Chemical Company

"First in Oil Field Acidizing . . . Since 1932"

Look to **DOWELL**

FOR OIL INDUSTRY CHEMICAL SERVI

UNIVERSITY OF MICHIGAN LIBRARIES